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STUDIES OF THE EFFICIENCY OF WATER PURIFICATION PROCESSES. I. RESULTS OBTAINED FROM A PRELIMINARY STUDY OF THE CINCINNATI AND LOUISVILLE MUNICIPAL FILTRATION PLANTS. II/III. RESULTS OBTAINED FROM A COLLECTIVE SURVEY OF SEVENTEEN MUNICIPAL FILTRATION PLANTS

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T,- STUDIES OF THE EFFICIENCY OF WATER PURIFICATION PROCESSES

I. RESULTS OBTAINED FROM A PRELIMINARY STUDY OF THE CINCINNATI AND LOUISVILLE MUNICIPAL FILTRATION PLANTS

II AND III. RESULTS OBTAINED FROM A COLLECTIVE SURVEY OF SEVENTEEN MUNICIPAL FILTRATION PLANTS

By Sanitary Engineer H. W. Streeter - m. ent.
United States Public Health Service

PREPARED BY DIRECTION OF THE SURGEON GENERAL

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FOREWORD

In the following report are presented the results of observational surveys of the bacterial efficiency of certain municipal water-purification plants, which have been made by the Public Health Service in connection with a comprehensive study of the relations existing between the pollution of raw water supplies, taken for purification from streams receiving sewage and other wastes, and the sanitary quality of effluents produced from such sources of supply by current processes of water purification. In Part I of this report are given the results of a preliminary survey of the performance of two municipal plants, both located on the Ohio River, at Cincinnati and Louisville, respectively, which was made in the years 1915–16. In Part II are presented the results of a more recent survey, made in the years 1923–24, of 10 municipal plants located on the Ohio River, including the two previously studied, and, in Part III, the results of a similar survey made during the same period and covering seven plants located at various points in the Eastern and Middle Western States.

Owing to the large volume of data collected in these studies, it has appeared inadvisable to undertake in the current report anything further than the presentation of the results in full and a discussion of such features of them as are of primary significance. In subsequent reports of this series it is intended to discuss the data of these surveys from a number of special angles and to present the results of some experimental studies of the efficiency of water purification, in progress at this writing, which have a direct bearing on the conclusions to be drawn from the studies as a whole.

In submitting this report, it is desired to make grateful acknowledgment to the operating officials of the various plants who have collaborated in the collection of the data, to a number of sanitary engineers of State health departments who have given helpful suggestions in the matter of selecting the more suitable plants for study, to officials of the Ohio State department of health, and especially to Mr. F. H. Waring, chief engineer, for particularly active cooperation in completing arrangements for the collection of field data in that State, and, finally, to our advisers, Mr. Joseph W. Ellms, Prof. Stephen A. Forbes, Dr. Edwin O. Jordan, Mr. Langdon Pearse, and Prof. Earle B. Phelps, whose interest and advice have been of the utmost value in connection with these studies. It also is desired to express appreciation of the valuable assistance rendered by statistical clerk Raymond B. Otting and stenographer-typist Hermina M. Lamott, of the Stream Pollution Investigations Laboratory staff, in performing a large part of the statistical work and in correcting the final manuscript and proof of this report.

INTRODUCTION

Studies of the bacterial efficiency of municipal water-purification plants, with which the surveys described in the present report have been chiefly concerned, have formed a logical part of a comprehensive program of stream-pollution investigations undertaken by the Public Health Service in accordance with authority conferred by an act of Congress in 1912. These investigations, having dealt primarily with those phases of stream pollution which have a direct bearing on the public health, the safety of public water supplies derived from sewage-polluted streams, and more especially the relation between the sanitary quality of such supplies and the permissible degree of pollution of their sources, have been subjects of basic importance for inquiry.

In approaching the problem from this angle, it has been recognized that all public water supplies derived from surface sources should be subjected to thorough and efficient purification, regardless of the manner or the extent of pollution of such sources. The question, therefore, has not been one of defining a boundary condition of stream pollution as indicating whether water supplies taken from streams should or should not be purified, but rather one of determining the limiting degree of such pollution which is consistent with the production, at a reasonable cost, of safe and palatable purified water supplies from these sources. Such a limit, if definable, should provide a direct measure of the safely permissible extent of pollution of streams at points where waterworks intakes are located. Properly corrected for the effects of natural purification taking place in streams between such intakes and various upstream points of discharge of sewage, it should afford a definite base line from which the amounts of wastes discharged into streams at various points may be restricted within proper bounds. It thus is apparent that the definition of the safe limit of bacterial loading of water-purification plants bears a direct and vital relation to the broader question of fixing the permissible degree of pollution of streams used as sources of public water supplies.

In considering this question from a public health standpoint, two distinct aspects of it are presented for study. First is the question of defining, in measurable terms, a "safe" purified water supply for public uses. Second is that of determining, in the same terms, the limiting pollution of raw-water supplies, as delivered for purification, which is consistent with the production of effluents thus defined as being "safe." Obviously, no complete or final solution of the problem is possible without a definite answer to both of these questions. It is evident, furthermore, that both specifications must be expressed in mutually comparable terms, capable, moreover, of being converted directly into measurable units of stream pollution. Virtually the only specification satisfying these requirements is that which defines the bacterial quality of a water.

Aside from the United States Treasury Department standard,[1] which imposes a definite limit on the *B. coli* content of drinking waters served to the public by the interstate carriers, no widely accepted standard exists in the United States at the present time whereby a "safe" public water supply may be defined in bacteriological terms capable of being converted directly into those of raw water or stream pollution. In considering the question of permissible limits of raw-water pollution, which has been the subject of the studies described in this report, it has been necessary, therefore, to use the Treasury Department standard as the major base line for a discussion of such limits, bearing in mind, however, the possibility of future revision of this standard as applied to judging the safety of purified municipal water supplies for domestic uses. Further than what has just been noted, the surveys described in the present report have not been concerned with the question of standards as defining the relative safety of purified municipal water supplies, but have been confined wholly to the second question above stated.

The International Joint Commission Standard.

The first consideration given to the question of permissible pollution of raw-water supplies taken from polluted bodies of water for purification was in the year 1914, when the International Joint Commission, empowered by the Governments of Canada and the United States to consider questions affecting the international boundary between the two countries, called into consultation a group of sanitary experts for the purpose of obtaining their opinion regarding a number of basic questions concerned with the pollution of the international boundary waters. Among the questions thus submitted was the following:

> What do you consider to be an unreasonable burden to place upon the bacterial purifying capacity of a modern efficient water purification plant? [2]

In reply to this question, the consensus of opinion of the experts was given by the following statement in a résumé of testimony by this board, dated June 24, 1914:

> While present information does not permit a definite limit of safe loading of a water-purification plant to be established, it is our judgment that this limit is exceeded if the annual average number of *B. coli* in the water delivered to the

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[1] Report of Advisory Committee on Official Water Standards, U. S. Treasury Department. Public Health Reports, Apr. 10, 1925, pp. 693–721. Reprint No. 1029.

[2] International Joint Commission Report on Conference with Sanitary Engineers, New York City, May 26 and 27, 1914, p. 8.

> plant is higher than about 500 per 100 cubic centimeters, or if in 0.1 cubic centimeter portions of the water *B. coli* is found 50 per cent of the time. With such a limit the number of *B. coli* would be less than the figure during part of the year and would be exceeded during some periods.

That this standard was regarded by the commission and its engineers as being but a tentative one (subject to readjustment as further knowledge accumulates with regard to the various complex factors involved in its prescription) is reflected in the following passage from its final report:[3]

> It is scarcely necessary to remark that the engineers are speaking of bacterial pollution only. In view of the present state of progress in sanitary science, this limit or standard must be regarded as tentative. Their evidence showed that they regarded the question as profoundly affected by conditions and in no sense capable of absolute generalization.

The standard adopted by the commission, while admittedly tentative, and restricted to Great Lakes waters in its application, marked a progressive and courageous initial step toward an ultimate solution of the more general problem of defining in measurable terms the limits of pollution of sources of water supplies located in surface lakes and streams. The particular standard adopted in this case was obviously not intended to be applied, at least without modification, to waters differing as widely from those of the Great Lakes as does that of the Ohio River. Moreover, as was pointed out in the final report[4] of the commission:

> The data necessary for the formulation of a fixed standard either of sewage purification or of water purification are not sufficiently well established at the present time. By more precise methods of experimental study there will doubtless be obtained in the future a more ample and accurate command of facts, which will admit of the determination of a more definite standard.

Preliminary Study by the Public Health Service in 1915–16.

In the year 1914, in connection with studies of stream pollution in the Ohio River by the United States Public Health Service, the importance of ultimately defining in specific terms a limiting degree of pollution of the Ohio River and its tributaries at points from which municipal water supplies are taken for purification was realized, owing to the fact that the use of streams in the Ohio River Basin for municipal supplies is the most fundamental interest involved in the pollution of such streams both by domestic sewage and industrial wastes. Immediately following the completion of the main portion of field and laboratory surveys of the Ohio River[5] a preliminary study of the question of permissible bacterial loading of purification plants treating Ohio River water was undertaken through an observational study of the municipal filtration plants located at Cincinnati and Louisville, the observations being made at both plants throughout a period of 13 months, from June 1, 1915, to June 30, 1916, inclusive.

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[3] Final Report of the International Joint Commission on the Pollution of International Boundary Waters Reference, 1918, p. 36.

[4] Loc. cit., p. 37.

[5] See Public Health Bulletins Nos. 131, 143, and 146, for a full report of these surveys.

The specific objectives of this preliminary study were to obtain an approximate idea of the relations, if any, existing between the character of raw water delivered to each plant and that of the effluents obtained under different conditions, and, in addition, to secure a fairly definite knowledge as to the most suitable method of procedure for further studies of the question in a more elaborate scale. Incidentally it was hoped that some tentative conclusion might be reached as to the approximate limiting bacterial pollution of Ohio River water which was consistent with the delivery of effluents by these two plants having a satisfactory bacterial quality according to any specified standard which might be developed, bearing in mind the limitations of existing standards which previously have been noted (p. XVI–XVII).

For conducting this preliminary study, the following plan was adopted. A branch laboratory was located at each plant, in which was stationed a trained bacteriologist in the employ of the Public Health Service, with one or more laboratory attendants to assist him in the collection and examination of samples of water. Each laboratory was fully equipped with apparatus from the central stream pollution headquarters at Cincinnati and was supplied with culture media from this laboratory. Precautions were taken to insure as far as practicable the comparability of results obtained by the two branch laboratories by having the bacteriologists carefully trained in a uniform laboratory procedure and by supplying them with culture media and other materials carefully standardized at the central laboratory. Daily examinations of samples of raw water and of effluents obtained at each successive stage of purification were made at each laboratory, the schedule of collections and examinations being carried out as closely in conformance with that of the plant laboratory as was consistent with the purpose in view. In order to obtain a reasonably accurate check on the results being obtained at the service laboratories as compared with those at the regular plant laboratories, duplicate examinations were made by both bacteriologists in each case, employing the same samples for this purpose.

The data collected from the study included results of physical, chemical, and bacteriological examinations obtained from samples collected as above outlined, also certain operation data for the plant, and in addition the results of a number of special observations relative to the efficiency of filtration, chlorination, etc.

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The results of this study, which were presented briefly in a paper[6] published in 1922, are given more fully in Part I of this report, to which reference is made also for a more detailed account of the methods followed in analyzing the data and of the conclusions tentatively reached from the analysis.

For purposes of the present discussion, these conclusions may be stated briefly as follows:

1. A definite quantitative relation was found to exist between the bacterial quality of the raw river water, as delivered to the plant, and that of the effluents produced at successive stages of purification.

2. A fairly well defined relation was found between the efficiency of purification, as measured in terms of the percentages of bacterial numbers removed from the influent water or remaining in the effluent water, and the numbers of bacteria initially present in the raw or the influent water.

3. The bacterial relations above noted were found to be influenced to a minor extent by variations in turbidity and, at certain stages of purification, by seasonal changes, but to a large degree were shown to be independent of other factors.

4. The establishment of these relations if confirmed, by further studies, was shown to provide a basis for evaluating, in bacteriological terms, a limiting safe degree of pollution of raw water supplies delivered to purification plants for treatment, consistent with the production of effluents of any required degree of bacterial purity.

Perhaps the most useful result of this preliminary study was its indication of the most profitable methods to be followed in further studies of the question. It was apparent that further studies were needed, owing to the limited range of conditions available for observation at merely two purification plants of the same type, taking their raw-water supply from the same stream.

Further studies of this problem were delayed, however, by the war and by other projects engaging the attention of the staff of the stream pollution investigations station in the few years immediately following the war. Under authority by the Surgeon General of the Public Health Service dated December 20, 1922, a more elaborate study of the question was taken up following a preliminary survey of its possibilities and certain recommendations by the advisory board[7] employed by the Public Health Service in connection with stream-pollution projects.

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[6] The Loading of Filter Plants, H. W. Streeter, Jour. Am. W. W. Assoc., March, 1922; also Reprint No. 737, Public Health Reports, Mar. 31, 1922.

[7] The personnel of the advisory board includes Prof. S. A. Forbes, University of Illinois; Prof. E. O. Jordan, University of Chicago; Mr. Langdon Pearse, sanitary engineer, sanitary district of Chicago; Prof. E. B. Phelps, Columbia University; and Dr. L. J. Reed, Johns Hopkins University.

From the preliminary study of 1916, the need was evident for a survey of the problem covering a wider range of actual conditions and in part offering facilities for a certain amount of experimental adjustment and control of the water-purification processes under observation. The former could be secured only through a survey of a fairly large number of plants in actual service, the group being a representative one and preferably dealing with raw waters of the more highly polluted type. Owing to the fact, however, that any experimental control of a municipal water-purification plant in actual service is out of the question, for obvious reasons, it was decided to meet the latter condition by constructing and operating an experimental water-purification plant to be located on the grounds of the stream pollution investigations station at Cincinnati, Ohio. At this plant it was proposed to study the efficiencies of purification obtainable from various water-purification processes under conditions in which the character of the raw-water supply can be varied at will and maintained in the zone of bacterial overloading for sustained periods of time. The experimental plant has been constructed and is in operation at this writing, though the observations have not progressed sufficiently to justify the drawing of any final conclusions from them.[8]

Survey of Municipal Plants.

In undertaking the survey of municipal plants, the specific plants to be surveyed were selected after correspondence with a number of State sanitary engineers and with the operators of a considerable number of municipal water-purification plants with a view to ascertaining the facilities available for the purpose in view and the possibilities for undertaking collaborative work at the plants which might be chosen for study. The final selection was actuated by two purposes in view:

(*a*) To study the raw-water conditions being encountered and the results of purification being obtained at a series of plants along a single highly polluted stream affording a common source of raw-water supply.

(*b*) To study a number of isolated examples, each one typical of a different though fairly representative problem.

The extent of the list of plants to be selected for study was limited by funds available for the purpose, though it was deemed necessary to observe a sufficiently wide variety of them to give a fairly definite idea of the essential factors involved in the problem.

For the purpose first named, 10 municipal water-purification plants located directly on the Ohio River were chosen, owing to the importance of this stream as a source of water supply, to the extent of its pollution, and to the opportunity thus provided for making a resurvey of the bacterial condition of this stream at various points after an interval of nearly 10 years elapsing since the previous laboratory survey of the river in 1914.[9] The list of Ohio River plants included those at East Liverpool, Ohio; Steubenville, Ohio; Huntington, W. Va.; Ashland, Ky.; Ironton, Ohio; Portsmouth, Ohio; Cincinnati, Ohio; Louisville, Ky.; Evansville, Ind.; and Henderson, Ky. For the remaining group of plants located elsewhere, the following were selected: Albany, N. Y.; Chester, Pa.; Elmira, N. Y.; Hackensack, N. J.; Niagara Falls, N. Y. (municipal plant); Toledo, Ohio; and Youngstown, Ohio. Each one of these plants was chosen for various reasons, but chiefly because an adequate schedule of laboratory examinations is carried out at each plant, and because in each case the problem presented is fairly representative of similar problems over a considerable area.

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[8] For a description of the experimental plant and a preliminary review of the results of the primary experiments, see Reprint No. 1114 from the Public Health Reports, Oct. 1, 1926.

Collection of Data.

The preliminary arrangements for collecting the data included a personal visit to each plant, at which time arrangements were made for the collaboration of the plant operator in carrying a certain schedule of laboratory work and in making regular reports to the headquarters at Cincinnati. During each visit a thorough physical inspection was made of the plant and of its facilities for performing the necessary laboratory work.

In order to obtain comparable data, it was necessary to secure as close coordination of laboratory methods as was practicable. No exact uniformity in the methods employed at the various laboratories was possible, however, owing to the variations in established practice at the different plants and the necessity of adhering to these procedures in certain essential respects in order to keep the plant records consistent historically. In a number of cases where the procedure employed departed widely from methods commonly considered as standard, concessions were made in the matter of changing the technique, and after a considerable amount of correspondence and several personal conferences a reasonable uniformity of methods was effected. (In Appendix D of the present report is given a memorandum on the laboratory procedures finally adopted.)

Compilation of Data.

In accordance with the arrangements above described, summaries of daily operation records and laboratory results were submitted monthly to the central office at Cincinnati by each collaborating plant operator. In connection with each monthly report a special record was made of any unusual conditions encountered at a particular plant, and in certain cases a continuous record of matters of special interest was maintained by the collaborator and transmitted with his report.

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[9] See Public Health Bulletin No. 143, U. S. Public Health Service, Washington, D. C.

From the summaries of daily records submitted monthly, a systematic compilation of these data was carried on progressively at the Cincinnati headquarters, the first step in such a compilation being a thorough checking of the entries on the summaries as submitted. Tabulations of monthly and seasonal averages of the various operation and laboratory data were prepared in this way; likewise a systematic classification of the data according to season, raw-water turbidity and bacterial content of the raw water, these sortings of the data being made as the reports were received. Any computations made by the collaborator were checked in each case, and any apparent abnormalities were checked by correspondence.

For purposes of analysis the data obtained from the various plants were divided into two groups:

(*a*) Data from the 10 plants located directly on the Ohio River (presented in Part II).

(*b*) Data from the eight plants located elsewhere (presented in Part III).

In this connection, reference should be made to a recent publication,[10] in which some of the preliminary results obtained from the Ohio River plants have been summarized.

In Part I, which immediately follows, the data collected in the preliminary study of 1915–16 will be presented in considerable detail, notwithstanding the fact that the results of the 1923–24 survey are more recent by nearly 10 years and undoubtedly indicate present conditions affecting the performance of water-purification plants along the Ohio River far more closely than do those of the former study. This procedure will be followed not only because the results of the earlier study form an essential part of the record of the survey as a whole, but also because they were obtained under circumstances in which the laboratory observations were subject to a closer degree of control and coordination than was practicable in connection with the 1923–24 survey. Moreover, the earlier results provided a basis for the statistical procedures followed throughout this report and, in a broad sense, for the conclusions reached from the later surveys.

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[10] Some Preliminary Observations from a Study of Water Filtration Plants Along the Ohio River. Proceedings of the Fourth Ohio Conference on Water Purification, 1924; also Reprint No. 987 from Public Health Reports, Jan. 30, 1925.

PART I

RESULTS OF PRELIMINARY STUDY OF THE CINCINNATI AND LOUISVILLE FILTRATION PLANTS IN 1915-16

Introductory.

The Cincinnati and Louisville filtration plants have been so fully described in the engineering journals that any description of them here appears unnecessary, beyond noting that both plants are of the modern rapid sand type, having two stages of preliminary sedimentation (with coagulation in connection with the secondary stage), followed by rapid sand filtration and chlorination. At the time of this study chlorine was being added continuously to the filter influent at the Louisville plant and to the filter effluent at the Cincinnati plant. The coagulant used at Louisville was sulphate of alumina and at Cincinnati lime and sulphate of iron. Aside from these and certain minor structural differences, which are shown in the descriptive tabulations given in Appendix C of this report, the two plants are very similar to each other in design and method of operation. In Figures 1 and 2 are given diagrammatic sketches[1] of the two plants, showing the general arrangement of their various major divisions.

The general procedure followed in connection with the preliminary study of the performance of the municipal filtration plants at Cincinnati and Louisville has been described in the introductory section of this report. In addition to what has been stated, it is desirable to note a few particulars concerning the laboratory operations connected with the study.

Through the courtesy of the respective waterworks officials at Cincinnati, comprising Mr. J. A. Hiller, general superintendent, and Mr. J. W. Ellms, then superintendent of filtration, and at Louisville, Mr. J. A. Wilson, chief engineer, and Mr. W. H. Lovejoy, superintendent of filtration, satisfactory arrangements were made whereby a branch laboratory of the Public Health Service was installed and operated at each plant, using working space assigned in the regular plant laboratories. The branch laboratory at the Cincinnati plant was in charge of Sanitary Bacteriologist E. E. Smith, 2d, and at the Louisville plant in charge of Sanitary Bacteriologist (now Passed Assistant Surgeon) M. V. Veldee, who was relieved by Sanitary

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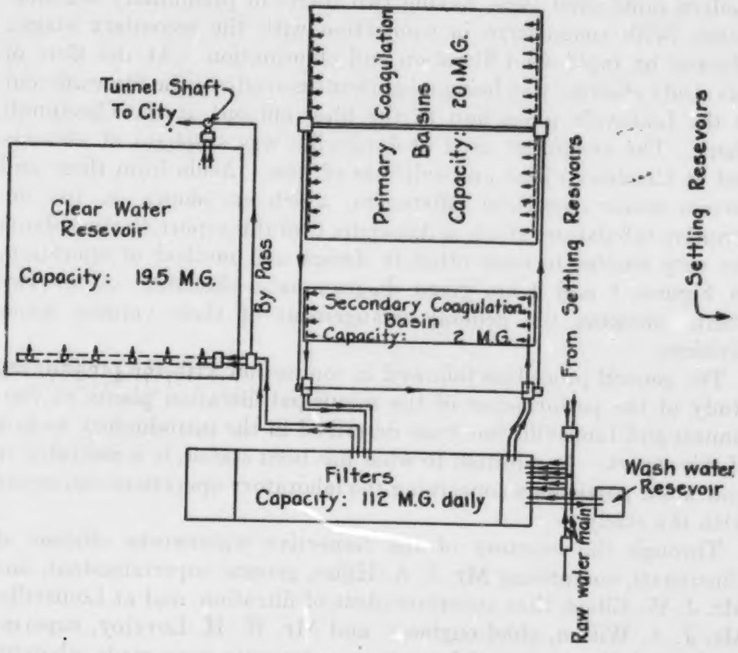
[1] Not drawn to scale.

Bacteriologist (now Bacteriologist) C. T. Butterfield in September, 1915, until completion of the work. The bacteriologist in charge of each laboratory was assisted by an attendant, who collected routine samples, sterilized glassware and other apparatus, and performed such other duties as were necessary. The operation of the branch laboratory was carried on independently of the plant laboratory and without interfering with the routine operation of the plant.

Fig. 1

SKELETON PLAN OF CINCINNATI FILTRATION PLANT
(Not to scale)

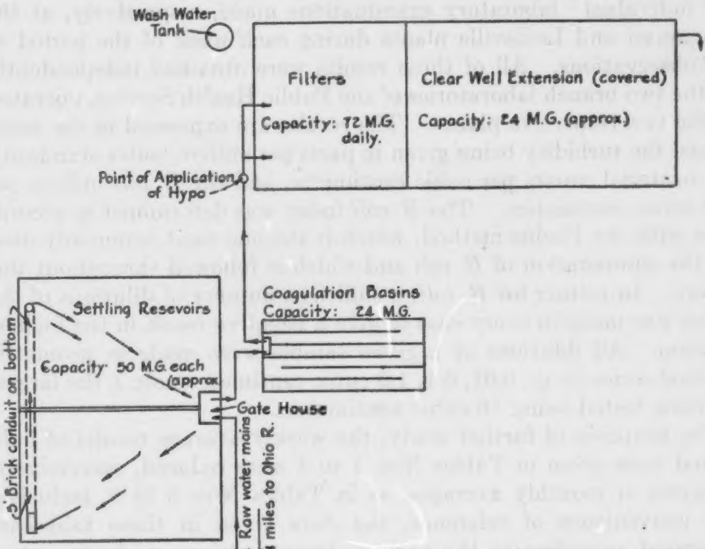

Tunnel Shaft
To City
Clear Water
Resevoir
Capacity: 19.5 M.G.
By Pass
Primary Coagulation
Basins
Capacity: 20 M.G.
From Settling Resivoirs
Settling Resevoirs
Secondary Coagulation
Basin
Capacity: 2 M.G.
Filters
Capacity: 112 M.G. daily
Wash water
Resevoir
Raw water main

The schedule of sample collections paralleled those of the two plant laboratories in respect to the points and times of collection. Samples of the raw water and city tap water were collected once daily (in the morning), and, of the effluents at each succeeding stage of purification, twice daily (morning and afternoon). This schedule was followed daily, exclusive of Sundays and holidays. At the Cincinnati plant the routine effluent samples comprised (*a*) primary (plain) settled water, (*b*) filter influent (applied) water, (*c*) unchlorinated filter effluent, and (*d*) chlorinated filter effluent after passage through the filtered water-storage reservoir. (See fig. 1.) At the Louisville plant they included (*a*) primary (plain) settled water, (*b*) unchlorinated filter influent (applied) water, (*c*) chlorinated filter influent water, and (*d*) filter effluent. (See fig. 2.) The only difference in these two schedules of sample collections was occasioned by the fact that at Cincinnati the water is chlorinated after filtration, whereas at Louisville the chlorine was being added to the water before filtration.[2]

FIG. 2.

SKELETON PLAN OF LOUISVILLE FILTRATION PLANT

(Not to scale)


Wash Water Tank
Filters
Capacity: 72 M.G. daily.
Clear Well Extension (covered)
Capacity: 24 M.G. (approx)
To City
Point of Application of Hypo
Coagulation Basins
Capacity: 24 M.G.
Settling Resevoirs
Capacity 50 M.G. each (approx
Gate House
5' Brick conduit on bottom
4 Raw water mains
2 ¼ miles to Ohio R.

The methods of laboratory examinations followed at both branch laboratories were as prescribed in the Standard Methods of Water Analysis of the American Public Health Association current at that time, special precautions being taken to have all procedures exactly the same at the two laboratories. In order to insure that culture media were identical in every respect, approximately half of each lot, prepared at the main stream pollution investigations laboratory at Cincinnati, was sent to each one of the two branch laboratories and used simultaneously. All standards employed were prepared and used likewise.

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[2] Since the time of these observations the point of application of chlorine has been changed at the Louisville plant from before to after filtration.

In addition to the laboratory data, daily operation figures, including the volume of water treated, the amounts of chemicals used, and filter operation data, were compiled from the plant records and forwarded with the weekly laboratory reports from each branch laboratory. These operation records, though used as an aid in interpreting the laboratory results, are not given in full in connection with the present report, owing to their voluminous nature and to the fact that they are not essential to the presentation of the laboratory data.

Presentation of Base Data.

In Tables Nos. 1, 2, 3, and 4 are presented the average results of the individual [3] laboratory examinations made, respectively, at the Cincinnati and Louisville plants during each week of the period of the observations. All of these results were obtained independently by the two branch laboratories of the Public Health Service, operated at the two respective plants. The results are expressed in the usual terms, the turbidity being given in parts per million (silica standard), the bacterial counts per cubic centimeter, and the *B. coli* indices per 100 cubic centimeters. The *B. coli* index was determined in accordance with the Phelps method, which is the one most commonly used for the enumeration of *B. coli* and which is followed throughout this report. In testing for *B. coli*, a sufficient number of dilutions of the water was made in every case to give a negative result in the highest dilution. All dilutions of a given sample were made in geometric decimal series (e. g., 0.01, 0.1, 1.0 cubic centimeters, etc.), the largest portions tested being 10 cubic centimeters.

For purposes of further study, the weekly average results of individual tests given in Tables Nos. 1 to 4 were reduced, successively, to terms of monthly averages, as in Tables Nos. 5 to 8, inclusive. For convenience of reference, the data given in these tables are separated according to the various determinations made (i. e. turbidity, 20° bacterial count, etc.), and each table shows a parallel chronological tabulation of the results obtained at the two plants. The period covered by these tabulations has been 13 months in each case, the entire period of the observations. Although it will be preferable, for certain special purposes, to utilize the results obtained during the first 12 months of the period (i. e., from June, 1915, to May, 1916, inclusive), constituting an exact calendar year, it has been considered desirable to use, as far as may be practicable, the results for the entire 13 months in connection with the analysis of the data.

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[3] The results of the individual examinations have been omitted for the sake of economy of space.

TABLE NO. 1.—*Weekly average turbidity of water at successive stages of treatment*

Week ended—	Turbidity, parts per million, silica standard							
	Cincinnati filtration plant				Louisville filtration plant			
	Raw	Settled	Coagulated	Filtered	Raw	Settled	Coagulated	Filtered
1915								
June 5	380	130	14	0	497	179	19	0
June 12	245	100	16	0	285	171	16	0
June 19	450	140	18	0	175	131	8	0
June 26	364	139	19	0	372	260	10	0
July 3	273	61	14	0	89	97	7	0
July 10	632	167	15	0	870	488	19	0
July 17	455	193	18	0	775	490	19	0
July 24	371	58	16	0	171	153	11	0
July 31	142	44	15	0	135	119	15	0
Aug. 7	161	30	9	0	78	38	12	0
Aug. 14	277	55	12	0	194	71	23	0
Aug. 21	253	86	14	0	202	102	23	0
Aug. 28	125	30	12	0	193	122	17	0
Sept. 4	146	34	10	0	90	78	12	0
Sept. 11	288	64	11	0	178	80	27	0
Sept. 18	197	60	16	0	122	82	10	0
Sept. 25	101	33	11	0	63	59	18	0
Oct. 2	164	46	11	0	78	29	19	0
Oct. 9	388	94	13	0	408	108	22	0
Oct. 16	194	40	12	0	160	92	18	0
Oct. 23	45	18	11	0	43	41	17	0
Oct. 30	88	12	8	0	67	31	27	0
Nov. 6	13	6	5	0	21	19	16	0
Nov. 13	7	4	3	0	21	19	14	0
Nov. 20	190	13	6	0	174	60	18	0
Nov. 27	182	26	12	0	238	98	24	0
Dec. 4	107	18	9	0	80	53	15	0
Dec. 11	27	11	7	0	45	31	11	0
Dec. 18	187	16	6	0	283	22	8	0
Dec. 25	442	155	13	0	772	274	43	0
1916								
Jan. 1	286	120	9	0	434	226	24	0
Jan. 8	278	145	15	0	350	207	42	0
Jan. 15	323	112	14	0	516	173	28	0
Jan. 22	217	132	16	0	340	330	30	0
Jan. 29	131	80	9	0	195	133	20	0
Feb. 5	343	125	9	0	772	292	30	0
Feb. 12	122	96	10	0	148	154	21	0
Feb. 19	308	138	11	0	453	210	22	0
Feb. 26	130	98	10	0	163	136	20	0
Mar. 4	170	74	7	0	102	88	20	0
Mar. 11	238	90	8	0	615	184	28	0
Mar. 18	227	99	6	0	298	192	19	0
Mar. 25	202	68	6	0	149	122	22	0
Apr. 1	769	213	5	0	795	225	20	0
Apr. 8	147	95	5	0	208	201	23	0
Apr. 15	102	34	4	0	111	63	17	0
Apr. 22	75	23	3	0	191	37	10	0
Apr. 29	79	16	4	0	92	50	26	0
May 6	51	9	3	0	55	20	18	0
May 13	302	88	9	0	252	47	22	0
May 20	107	54	5	0	117	84	27	0
May 27	67	7	3	0	50	25	12	0
June 3	369	36	5	0	168	42	13	0
June 10	428	123	4	0	397	124	35	0
June 17	224	95	7	0	202	115	14	0
June 24	250	82	9	0	482	127	25	0
July 1	247	85	8	0	226	114	12	0

TABLE No. 2.—*Weekly average numbers of bacteria, growing on gelatin plates in 48 hours at 20° C., in water at successive stages of treatment*

Week ended—	Bacteria per cubic centimeter (gelatin, 20° C.)									
	Cincinnati filtration plant					Louisville filtration plant				
	Raw	Settled	Coagulated	Filtered	Final	Raw	Settled	Coagulated	Applied	Final
1915										
June 5	3,560	1,271	173	18	19	9,683	1,415	147	22	22
June 12	6,740	1,677	316	20	37	2,215	1,189	75	17	8
June 19	10,700	2,190	260	24	30	1,610	1,027	44	15	20
June 26	3,900	950	150	13	33	3,285	1,661	66	6	8
July 3	9,371	1,009	150	10	119	6,472	1,368	777	7	13
July 10	18,000	1,271	216	14	56	18,780	2,816	167	21	22
July 17	4,698	881	184	12	29	11,650	4,814	209	35	33
July 24	2,358	528	71	10	37	3,266	1,460	162	20	8
July 31	760	374	105	11	67	2,131	1,419	291	22	8
Aug. 7	1,831	543	186	22	60	870	255	115	18	74
Aug. 14	6,400	1,073	322	83	89	4,588	759	219	39	79
Aug. 21	2,760	1,079	295	35	71	4,378	1,261	202	29	18
Aug. 28	2,330	654	309	28	53	3,274	1,085	110	24	31
Sept. 4	5,200	804	338	40	61	2,183	766	103	24	16
Sept. 11	8,720	2,118	1,000	96	56	5,120	1,106	258	32	26
Sept. 18	2,930	818	376	39	42	1,379	567	114	27	12
Sept. 25	1,057	520	231	23	34	835	556	136	36	23
Oct. 2	2,673	678	240	22	31	1,395	434	170	36	20
Oct. 9	6,500	1,182	392	44	43	8,350	1,077	256	39	12
Oct. 16	2,735	945	249	22	23	4,369	945	131	10	7
Oct. 23	1,538	668	301	27	18	1,060	600	157	34	3
Oct. 30	2,251	479	201	25	56	3,160	845	538	55	13
Nov. 6	340	138	74	13	37	642	258	186	62	20
Nov. 13	193	73	59	20	18	390	249	198	48	25
Nov. 20	13,000	1,957	779	125	48	8,822	2,220	452	45	218
Nov. 27	13,540	2,680	1,277	144	66	13,060	6,144	1,102	104	167
Dec. 4	6,333	1,079	457	54	33	6,108	2,224	401	63	19
Dec. 11	7,083	1,399	677	85	41	36,000	1,435	302	77	4
Dec. 18	8,933	2,188	1,122	134	50	43,530	1,886	534	111	23
Dec. 25	35,900	9,925	3,425	1,082	366	59,330	24,730	5,583	947	4
1916										
Jan. 1	40,000	15,440	2,970	796	179	58,000	15,900	1,448	-------	[1] 284
Jan. 8	28,380	11,300	2,060	462	174	38,080	13,030	1,821	117	[1] 118
Jan. 15	37,300	13,020	2,301	376	121	36,170	12,510	1,168	68	7
Jan. 22	30,470	10,290	1,990	412	78	33,250	23,810	2,100	117	6
Jan. 29	26,680	7,608	1,435	400	41	18,380	14,290	1,378	190	4
Feb. 5	33,610	7,400	1,082	266	66	48,420	16,940	2,032	70	[1] 426
Feb. 12	11,600	4,859	810	163	41	11,600	8,373	868	36	3
Feb. 19	24,530	16,420	1,275	311	45	32,250	12,310	1,745	47	3
Feb. 26	14,370	3,880	896	191	40	13,330	8,086	669	45	3
Mar. 4	16,510	3,017	725	159	32	15,750	7,836	1,259	95	4
Mar. 11	20,260	4,208	841	177	36	33,000	10,740	1,391	111	5
Mar. 18	35,000	9,125	1,303	268	47	20,500	11,230	762	35	3
Mar. 25	19,600	6,508	1,308	255	45	12,000	7,573	8,589	36	2
Apr. 1	69,140	12,920	1,434	365	73	41,670	9,986	4,968	51	2
Apr. 8	12,370	2,584	432	141	49	13,600	6,309	429	51	4
Apr. 15	9,814	1,388	368	68	25	7,100	2,436	297	40	26
Apr. 22	4,086	1,043	389	56	29	8,633	1,855	567	44	3
Apr. 29	2,657	569	229	34	39	4,717	2,400	982	90	5
May 6	2,175	523	232	31	56	4,767	1,232	582	45	2
May 13	6,933	1,633	357	29	64	11,430	1,813	616	134	13
May 20	1,482	625	172	12	47	4,033	1,596	306	96	4
May 27	925	251	87	4	14	2,030	534	321	35	6
June 3	10,310	768	238	16	23	4,800	1,129	254	77	174
June 10	7,333	1,228	140	14	63	9,183	1,350	327	122	104
June 17	3,008	885	135	10	61	5,667	1,518	121	30	25
June 24	6,183	1,223	311	19	88	5,600	2,095	319	45	40
July 1	3,375	972	195	11	60	5,340	1,950	152	22	15

[1] Disinfection suspended during whole or part of designated weeks.

TABLE No. 3.—*Weekly average numbers of bacteria, growing on agar plates in 24 hours at 37° C., in water at successive stages of treatment*

Week ended—	Bacteria per cubic centimeter (agar, 37° C.)									
	Cincinnati filtration plant					Louisville filtration plant				
	Raw	Settled	Coagulated	Filtered	Final	Raw	Settled	Coagulated	Applied	Final
1915										
June 5	2,396	810	100	6	8	6,075	761	116	22	129
June 12	1,545	550	89	6	9	1,664	864	66	16	....
June 19	2,760	1,090	196	7	9	1,444	961	44	19	13
June 26	1,140	560	72	6	19	3,727	1,641	73	14	9
July 3	4,092	750	90	6	167	5,292	1,125	635	12	15
July 10	5,372	1,962	97	8	51	6,930	2,641	144	21	25
July 17	1,741	606	99	8	22	6,055	3,141	174	27	37
July 24	1,721	493	92	5	25	4,350	1,313	249	19	34
July 31	793	391	156	11	57	3,476	2,742	832	29	51
Aug. 7	1,943	480	191	14	39	729	347	140	17	178
Aug. 14	3,442	766	231	48	73	2,486	633	193	36	102
Aug. 21	2,900	944	317	33	76	3,833	772	249	27	39
Aug. 28	1,350	427	185	21	39	3,349	910	120	33	38
Sept. 4	2,108	387	174	28	39	1,750	614	89	27	25
Sept. 11	3,632	1,114	452	73	58	4,420	1,042	329	26	66
Sept. 18	1,312	657	277	34	41	1,453	629	163	30	22
Sept. 25	957	422	206	20	29	1,048	580	106	53	33
Oct. 2	2,205	356	151	13	16	2,027	492	233	36	10
Oct. 9	3,433	719	217	22	24	5,717	898	242	39	12
Oct. 16	1,063	291	103	9	8	2,807	845	130	24	7
Oct. 23	543	219	105	7	5	833	508	122	40	4
Oct. 30	437	105	49	5	15	1,822	564	353	46	6
Nov. 6	165	55	30	3	3	547	244	177	51	7
Nov. 13	77	32	20	5	4	318	200	149	46	17
Nov. 20	5,508	585	292	40	16	5,886	1,203	254	33	70
Nov. 27	2,552	816	361	48	16	5,630	2,181	530	56	7
Dec. 4	1,625	311	125	10	3	2,484	779	150	39	2
Dec. 11	468	150	77	7	4	687	396	84	38	4
Dec. 18	4,025	371	133	16	5	5,341	359	88	40	8
Dec. 25	5,200	2,752	594	141	36	11,100	6,075	1,145	219	6
1916										
Jan. 1	3,000	2,076	494	77	8	9,040	3,435	3,645	....	[1] 39
Jan. 8	2,600	1,624	286	45	8	4,616	2,162	389	110	17
Jan. 15	4,306	1,445	245	26	5	7,116	1,855	216	85	5
Jan. 22	2,795	1,421	275	31	6	3,622	3,309	392	79	6
Jan. 29	875	607	79	11	2	2,233	1,441	175	47	4
Feb. 5	2,447	868	95	11	3	6,283	3,246	448	50	[1] 73
Feb. 12	923	528	85	8	2	2,050	1,836	187	38	4
Feb. 19	25,800	1,036	159	17	5	5,500	2,519	288	39	4
Feb. 26	550	461	62	5	2	1,780	1,307	147	34	2
Mar. 4	1,058	370	82	8	4	1,817	950	198	45	5
Mar. 11	1,908	516	86	6	3	5,892	1,513	245	36	3
Mar. 18	1,422	591	105	5	2	2,383	1,621	147	27	2
Mar. 25	1,078	373	69	3	3	1,466	1,045	1,329	33	2
Apr. 1	5,900	1,483	130	13	2	3,500	1,452	487	32	2
Apr. 8	818	465	68	7	2	2,158	1,273	114	38	3
Apr. 15	767	255	55	4	2	1,170	445	89	27	6
Apr. 22	267	105	40	2	6	1,700	403	140	37	2
Apr. 29	181	56	25	1	2	1,333	629	284	46	3
May 6	138	55	30	2	1	1,374	306	207	30	14
May 13	1,158	386	101	5	6	3,433	786	340	92	4
May 20	513	264	62	3	14	2,266	940	334	57	5
May 27	448	94	42	1	2	1,128	335	169	25	2
June 3	2,598	304	86	5	2	2,670	459	193	48	108
June 10	3,205	620	83	8	29	3,800	771	251	68	68
June 17	1,097	423	72	5	17	2,300	607	77	17	14
June 24	1,807	471	139	9	25	4,283	1,031	271	37	32
July 1	1,068	463	89	4	16	2,880	1,415	115	15	[illegible]

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[1] Disinfection discontinued at Louisville during whole or part of designated weeks.

TABLE NO. 4.—*Weekly average numbers of B. coli in water at successive stages of treatment*

Week ended—	B. coli index per 100 cubic centimeters									
	Cincinnati filtration plant					Louisville filtration plant				
	Raw	Settled	Coagulated	Filtered	Final	Raw	Settled	Coagulated	Applied	Final
1915										
June 5	8,2[illegible]	1,540	1,351	125	5	23,500	1,720	181	13	28
June 12	3,000	1,495	172	18	6	1,000	[1] 3,159	173	48	13
June 19	20,800	928	478	32	14	2,800	[1] 4,730	348	1.4	6
June 26	670	397	317	32	6	7,030	3,142	197	12	[2] 18 (7)
July 3	35,050	2,944	223	21	14	38,170	5,050	423	10	1.8
July 10	44,200	360	451	36	18	10,000	3,970	190	13	3
July 17	20,630	2,377	389	40	40	8,470	6,670	595	12	[2] 14 (3)
July 24	5,500	703	308	32	32	2,530	[1] 9,190	2,134	1.8	1.8
July 31	2,224	325	150	8	25	2,800	1,990	1,594	38	4
Aug. 7	3,871	470	238	24	15	2,820	505	181	12	14
Aug. 14	3,970	622	165	40	38	7,030	1,567	173	6	[2] 14 (6)
Aug. 21	19,270	703	478	78	46	8,470	1,486	343	13	[2] 21 (11)
Aug. 28	2,200	478	164	142	45	1,000	[1] 2,539	424	12	12
Sept. 4	3,640	703	300	40	38	6,860	1,486	165	102	4
Sept. 11	22,600	1,810	1,450	271	163	32,600	1,990	308	7	2
Sept. 18	2,530	1,198	253	111	24	2,440	1,477	262	4	4
Sept. 25	2,530	694	1,109	25	31	5,500	2,530	667	16	3
Oct. 2	19,100	478	316	85	11	847	676	595	15	1.8
Oct. 9	7,080	1,423	622	317	133	3,970	2,377	181	22	0
Oct. 16	3,970	775	244	39	11	4,600	2,872	386	12	0
Oct. 23	830	703	253	126	1	3,970	724	172	5	0
Oct. 30	847	244	85	24	4	6,400	1,720	586	33	1.8
Nov. 6	380	62	32	8	11	694	262	165	17	0
Nov. 13	83	111	48	2.5	.8	2,080	252	163	22	11
Nov. 20	10,000	1,406	462	103	19	17,690	2,106	398	14	.9
Nov. 27	20,800	2,530	730	262	35	6,400	2,980	2,674	37	0
Dec. 4	847	325	303	7	4	3,817	667	100	13	0
Dec. 11	1,000	299	230	2.5	1.7	694	343	67	23	.9
Dec. 18	3,520	316	854	7	10	3,817	181	26	14	.9
Dec. 25	4,600	1,990	1,684	168	17	42,400	4,960	1,375	30	0
1916										
Jan. 1	4,600	910	190	44	3	4,600	3,610	235	-------	[3] 24
Jan. 8	2,440	622	310	94	2	36,640	1,720	229	11	4
Jan. 15	2,530	622	155	14	.8	3,970	1,639	75	1.8	0
Jan. 22	2,530	1,495	317	14	.8	6,400	1,810	172	1.8	0
Jan. 29	847	478	69	14	0	5,330	1,710	245	.9	0
Feb. 5	3,970	550	83	5.8	.8	5,500	2,340	343	3.3	[3] 32
Feb. 12	3,970	1,270	61	14	.8	6,940	1,720	262	0	0
Feb. 19	2,530	1,198	59	7.5	1.8	10,000	2,620	1,444	1.8	0
Feb. 26	820	1,270	28	3	0	4,420	2,827	199	0	0
Mar. 4	2,377	541	69	5	0	3,970	1,477	253	2.7	0
Mar. 11	694	325	55	11	0	5,500	829	318	1.8	.9
Mar. 18	3,664	397	208	3.3	.8	2,620	820	28	2	0
Mar. 25	253	91	40	3.3	0	2,134	508	25	0	0
Apr. 1	4,870	257	5.4	5	9.1	20,800	595	60	2.7	0
Apr. 8	2,199	233	69	28	0	2,409	1,573	75	1.8	0
Apr. 15	2,056	316	40	5.8	0	1,000	427	157	0	[3] 3.6
Apr. 22	699	150	32	1.6	0	3,999	591	419	3.6	0
Apr. 29	700	146	34	1.8	.1	4,000	591	418	3.6	0
May 6	2,048	166	129	2.4	0	3,848	1,410	672	9.9	0
May 13	849	549	250	23	5	3,898	1,409	754	120	.9
May 20	550	241	212	1.7	1.7	5,348	3,434	427	19	9
May 27	550	133	137	.8	0	1,000	1,245	174	3.6	1.8
June 3	2,800	630	181	4	2	1,000	600	200	29	[2] 16 (5)
June 10	6,997	2,049	400	16	23	22,000	1,409	345	141	6.3
June 17	849	625	242	22	106	6,997	3,290	100	22	2.7
June 24	20,500	855	391	130	47	8,497	1,818	509	32	1.8
July 1	2,620	1,450	181	17	63	8,200	2,710	370	4	3

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[1] Apparent increase in sedimentation basins due to disturbances incidental to cleaning of these basins.

[2] Each of the 5 weekly average results thus designated is abnormally high because of the influence of a single anomalous result, indicating in each case the presence of 100 *B. coli* per 100 cubic centimeters. In 4 of these cases a sample of disinfected filter influent taken simultaneously gave no *B. coli*, and in the fifth case it gave but 10 *B. coli* per 100 cubic centimeters. The corrected value derived by discarding the anomalous result in each case is given in parenthesis at the right of the uncorrected value.

[3] Disinfection suspended during whole or part of designated week.

Table No. 5.—*Monthly average turbidity of water at successive stages of treatment*

Month	Turbidity, parts per million, silica standard							
	Cincinnati filtration plant				Louisville filtration plant			
	Raw	Settled	Coagulated	Filtered	Raw	Settled	Coagulated	Filtered
1915								
June	303	119	16	0	287	177	13	0
July	411	108	16	0	426	239	15	0
August	196	50	12	0	168	85	19	0
September	183	50	12	0	103	67	19	0
October	177	39	11	0	164	66	21	0
November	98	13	7	0	107	48	18	0
December	203	61	9	0	319	118	20	0
1916								
January	254	116	14	0	392	207	29	0
February	209	113	10	0	330	195	24	0
March	331	109	6	0	419	160	23	0
April	114	48	4	0	165	92	22	0
May	129	38	5	0	116	42	19	0
June	319	91	7	0	318	114	21	0
June, 1915, to May, 1916, inclusive	217	72	10	0	250	125	20	0
June, 1915, to June, 1916, inclusive	225	73	10	0	255	125	20	0

Table No. 6.—*Monthly average numbers of bacteria, growing on gelatin plates in 48 hours at 20° C., in water at successive stages of treatment*

Month	Bacteria per cubic centimeter (gelatin, 20° C.)									
	Cincinnati filtration plant					Louisville filtration plant				
	Raw	Settled	Coagulated	Filtered	Final	Raw	Settled	Coagulated	Applied	Final
1915										
June	5, 376	1, 378	231	17	31	3, 988	1, 377	122	14	13
July	6, 930	850	149	12	64	8, 283	2, 482	316	22	18
August	3, 351	815	276	42	68	3, 334	847	149	27	45
September	3, 845	972	443	45	44	2, 038	646	153	32	19
October	4, 080	791	293	30	48	4, 067	863	267	37	10
November	6, 656	1, 149	515	78	41	5, 565	2, 028	448	60	98
December	19, 480	5, 775	1, 654	395	118	30, 586	8, 280	1, 393	246	70
1916										
January	31, 462	10, 294	1, 913	406	97	33, 473	15, 104	1, 543	122	46
February	19, 478	5, 456	963	225	47	25, 300	11, 469	1, 417	49	99
March	32, 887	7, 452	1, 153	245	47	25, 574	9, 785	3, 614	64	3
April	9, 280	1, 674	390	92	37	8, 892	3, 422	584	61	9
May	2, 772	740	215	99	44	5, 574	1, 273	443	77	20
June	6, 450	1, 068	199	14	62	8, 677	1, 683	234	61	57
June, 1915, to May, 1916, inclusive	12, 130	3, 112	683	141	57	13, 060	4, 798	871	68	38
June, 1915, to June, 1916, inclusive	11, 700	2, 955	645	131	58	12, 720	4, 559	822	67	39

Table No. 7.—*Monthly average numbers of bacteria growing on agar plates in 24 hours at 37° C., at successive stages of treatment*

Month	Bacteria per cubic centimeter (agar, 37° C.)									
	Cincinnati filtration plant					Louisville filtration plant				
	Raw	Settled	Coagulated	Filtered	Final	Raw	Settled	Coagulated	Applied	Final
1915										
June	1,792	686	108	6	13	3,279	1,088	105	17	31
July	2,885	871	113	8	72	5,100	2,253	414	22	35
August	2,311	637	223	28	55	2,574	661	164	27	83
September	1,783	592	259	35	38	2,055	657	199	36	33
October	1,656	352	124	11	13	2,799	704	223	36	8
November	2,086	357	168	22	10	3,158	907	256	46	24
December	2,801	1,056	267	47	10	5,215	2,040	335	78	13
1916										
January	2,594	1,245	215	27	5	4,568	2,183	280	77	8
February	1,648	707	102	11	3	3,629	2,185	274	38	20
March	2,304	678	95	7	2	3,113	1,344	512	35	3
April	628	254	50	4	3	1,627	716	157	40	3
May	565	197	60	3	5	2,062	565	255	49	15
June	2,078	484	96	7	20	3,294	910	183	38	36
June, 1915, to May, 1916, inclusive	1,921	636	149	17	19	3,187	1,275	265	42	23
June, 1915, to June, 1916, inclusive	1,933	624	145	17	19	3,195	1,247	258	41	24

Table No. 8.—*Monthly average numbers of B. coli in water at successive stages of treatment*

Month	B. coli index per 100 cubic centimeters									
	Cincinnati filtration plant					Louisville filtration plant				
	Raw	Settled	Coagulated	Filtered	Final	Raw	Settled	Coagulated	Applied	Final
1915										
June	3,966	878	340	43	11	8,920	3,744	245	19	12
July	22,731	1,483	310	30	29	13,240	3,980	880	15	5
August	3,346	548	262	66	34	4,924	1,450	283	14	14
September	6,680	1,000	688	97	59	7,480	1,763	411	32	3
October	7,154	964	337	137	36	4,204	1,728	326	18	.4
November	6,752	937	337	81	15	6,904	1,287	712	21	3
December	2,939	710	610	42	7	10,210	1,900	345	23	5
1916										
January	2,404	816	208	33	.8	12,840	1,878	174	4.2	1.3
February	3,212	1,056	59	8	.8	6,585	2,122	555	1.3	7.8
March	2,000	294	83	5.7	.0	7,126	853	129	1.4	.2
April	1,792	226	49	9	2	3,124	862	262	5.8	.8
May	996	315	193	6.5	1.5	3,284	1,731	492	36	5.2
June	7,507	1,155	283	43	53	2,078	484	96	7	20
June, 1915, to May, 1916, inclusive	5,331	769	290	46	16	7,403	1,942	401	16	4.8
June, 1915, to June, 1916, inclusive	5,498	799	289	46	19	7,630	1,957	394	18	4.7

Discussion of Data.

In the discussion of the data which follow, no effort will be made to present in detail the results of the various analyses of these data which have been made, attention being confined largely to such results as bear directly on the interpretation and analysis of the more extensive data to be presented in connection with Parts II and III of this report. As a preliminary to the analysis of the data, it is proposed to discuss briefly the average characteristics of the raw water and effluents as observed at the two plants during the period of the study.

Average Character of Raw Water and Effluents.

In Tables Nos. 5 to 8 have been shown figures representing the average character of raw water and of the effluents at successive stages of purification observed at the two plants in each successive month. In Table No. 9 are given the averages of these monthly means for the period of one year extending from June, 1915, to May, 1916. As regards the raw water, the picture thus presented is that of a water of moderately high turbidity and of decidedly high bacterial content, the latter varying considerably more widely than the former from month to month. On referring to Table No. 8, it is noted that the monthly average *B. coli* index of the raw water reached maxima of 22,700 and 13,200, respectively, at the Cincinnati and Louisville plants during the same month, July, 1915; and in no month was the index in either of the two raw waters as low as the upper limit, 500 per 100 cubic centimeters, fixed by the International Joint Commission for the Great Lakes boundary waters. The bacterial pollution of Ohio River water at the two intakes is thus shown to be of a decidedly higher order of magnitude than that which is comprehended by the Great Lakes standard. It is noted further that, in general, the bacterial content of the two raw waters is shown to be of about the same magnitude and to vary from month to month in similar directions and to approximately the same degree. The raw water at Louisville is shown to have been more highly polluted, as indicated by the *B. coli* figures, than at Cincinnati during the period of observation, the *B. coli* index at Louisville exceeding that at Cincinnati during 10 out of the 13 months of the period and averaging 7,400 per cubic centimeter for the 12 months, June, 1915, to May, 1916, inclusive, as compared with an average of 5,330 per 100 cubic centimeters at Cincinnati. (See Table No. 9.)

TABLE NO. 9.—*Averages of monthly means for the year, June, 1915, to May, 1916, inclusive*

CINCINNATI FILTRATION PLANT

	Raw	Settled	Coagulated	Filtered	Final
Turbidity	217	72	10	0	0
Bacteria per c. c., 20° C	12,100	3,110	683	141	57
Bacteria per c. c., 37° C	1,920	636	149	17	19
B. coli index, per 100 c. c	5,330	769	290	46	16

LOUISVILLE FILTRATION PLANT

	Raw	Settled	Coagulated	Applied[1]	Final
Turbidity	250	125	20	20	0
Bacteria per c. c., 20° C	13,100	4,800	871	68	38
Bacteria per c. c., 37° C	3,190	1,280	265	42	23
B. coli index per 100 c. c	7,400	1,940	401	16	4.8

[1] Coagulated water after chlorination and prior to application to the filters.

The average quality of effluents delivered by the two plants during the period June, 1915, to May, 1916, inclusive, is shown in Table No. 9. No highly significant differences are shown as between the character of corresponding effluents produced by the two plants, except in respect to their *B. coli* content, which is decidedly lower in the effluents from both primary and secondary stages of sedimentation at Cincinnati and in the final chlorinated effluent at Louisville. The relatively high reduction in *B. coli* accomplished at the Louisville plant, as compared with that observed at the Cincinnati plant, is attributable, in part at least, to the fact that at Louisville the water was being chlorinated[4] prior to filtration during the period of these observations, whereas at Cincinnati it was being chlorinated after filtration. The use of prefilter chlorination at Louisville permitted a rate of dosage equivalent to approximately three times that which was used at Cincinnati (the average chlorine dosage at Louisville being about 0.3 p. p. m. and at Cincinnati 0.1 p. p. m.). It also should be noted in this connection that at Cincinnati chlorination was suspended entirely during the summer months, whereas at Louisville it was continued at all seasons of the year.

The extent to which it was necessary at the Louisville plant to depend on chlorination for securing a final effluent of satisfactory bacterial quality is indicated by the results which were observed during, and immediately before and after, two short periods in December, 1915, and January, 1916, respectively, in which chlorination was discontinued temporarily owing to the failure in arrival of shipments of the disinfectant resulting from a railroad strike. During both of these periods the bacterial content of the river water was fairly high but not materially higher than at other times prior to and following these periods. The marked and sudden deterioration in the

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[4] During the earlier portion of the period, calcium hypochlorite was employed as a disinfectant at the Louisville plant, a permanent change to the use of chlorine being made in the spring of 1916. At the Cincinnati plant, chlorine was used throughout the entire period.

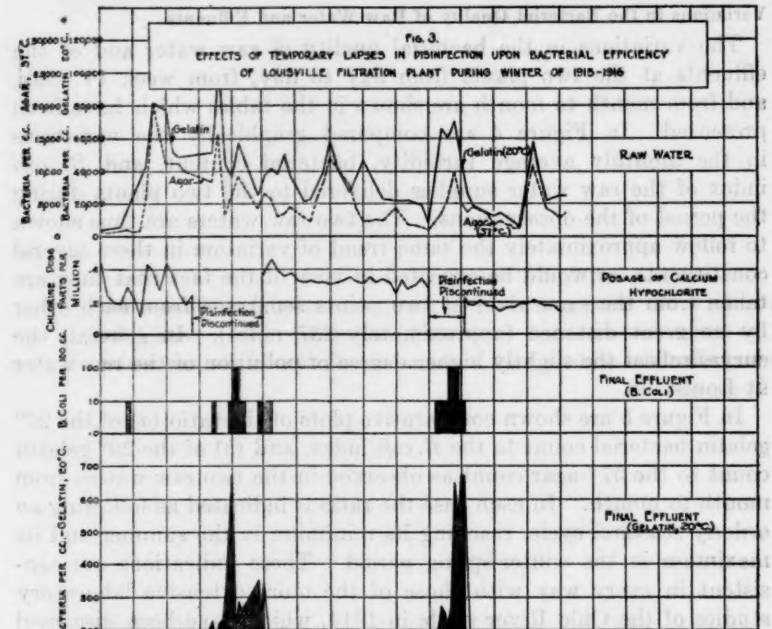

Fig. 3.
EFFECTS OF TEMPORARY LAPSES IN DISINFECTION UPON BACTERIAL EFFICIENCY OF LOUISVILLE FILTRATION PLANT DURING WINTER OF 1915-1916

bacterial quality of the final effluent resulting from this temporary lapse in chlorination is illustrated in Figure 3, in which are shown parallel chronological plots of the various elements involved in the situation. Striking evidence was thus afforded of the importance of continuous and effective chlorination as a measure for reinforcing the efficiency of filtration processes in the purification of Ohio River water under conditions prevailing at that time. Such evidence is worthy of note at this point, in view of later findings to be discussed in Part II of this report.

Variations in the Bacterial Quality of Raw Water and Effluents.

The variations in the bacterial quality of raw water and of the effluents at the two plants from day to day, from week to week, and from month to month are shown in the tables which have been presented. In Figure 4 are compared graphically the variations in the monthly average turbidity, bacterial content, and *B. coli* index of the raw water supplies delivered to the two plants during the period of the observations. The two raw waters are thus shown to follow approximately the same trend of variation in these several constituents, as would be expected in view of the fact that they are taken from the same river at two points separated from each other by no great distance (approximately 137 miles). In general, the curves reflect the slightly higher degree of pollution of the raw water at Louisville.

In Figure 5 are shown comparative plots of the ratio (*a*) of the 20° gelatin bacterial count to the *B. coli* index, and (*b*) of the 20° gelatin count to the 37° agar count as observed in the two raw waters from month to month. In each case the ratio is indicated as following an orderly seasonal cycle, reaching its minimum in the summer and its maximum in the winter-spring period. These indications are consistent in every way with those of the more extensive laboratory studies of the Ohio River made in 1914, which have been discussed fully in a previous publication.[5]

In Figure 6 have been drawn chronological plots showing the variations, from week to week, in the 20° bacterial counts observed in the several effluents at the Cincinnati plant, as compared with coincident variations in the bacterial content of the raw water. The bacterial counts are plotted on a logarithmic ordinate scale, in order that counts of the higher orders of magnitude may be brought within a convenient plotting range and that proportionate variations in the quantities plotted may be directly comparable, regardless of differences in their magnitude. Similar plots of the daily results of bacterial counts at 20° C. and 37° C. observed in the raw water and unchlorinated filter effluent at the Cincinnati plant are shown in Figures 7 and 8, and at the Louisville plant in Figures 9 and 10.

From a superficial inspection of these plots the close parallelism existing between variations in the bacterial quality of the raw water and that of the several effluents is clearly apparent. That their

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[5] See Public Health Bulletin No. 143, pp. 218–223.

14-a

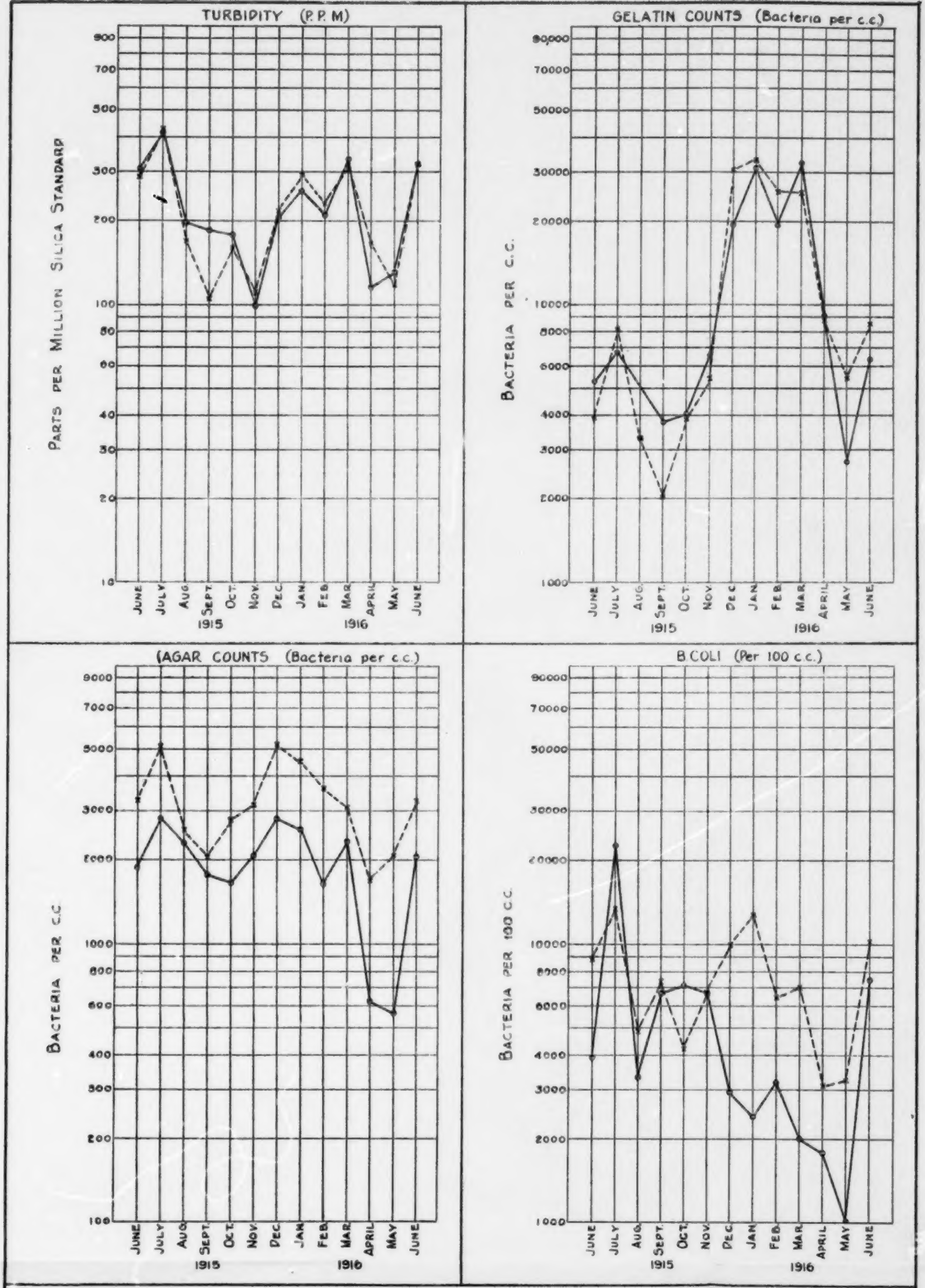

Fig. 4

MONTHLY AVERAGE TURBIDITY AND BACTERIAL CONTENT OF RAW WATER AT CINCINNATI AND LOUISVILLE FILTRATION PLANTS DURING PERIOD OF STUDIES

Cincinnati = o———o
Louisville = x- - - - -x

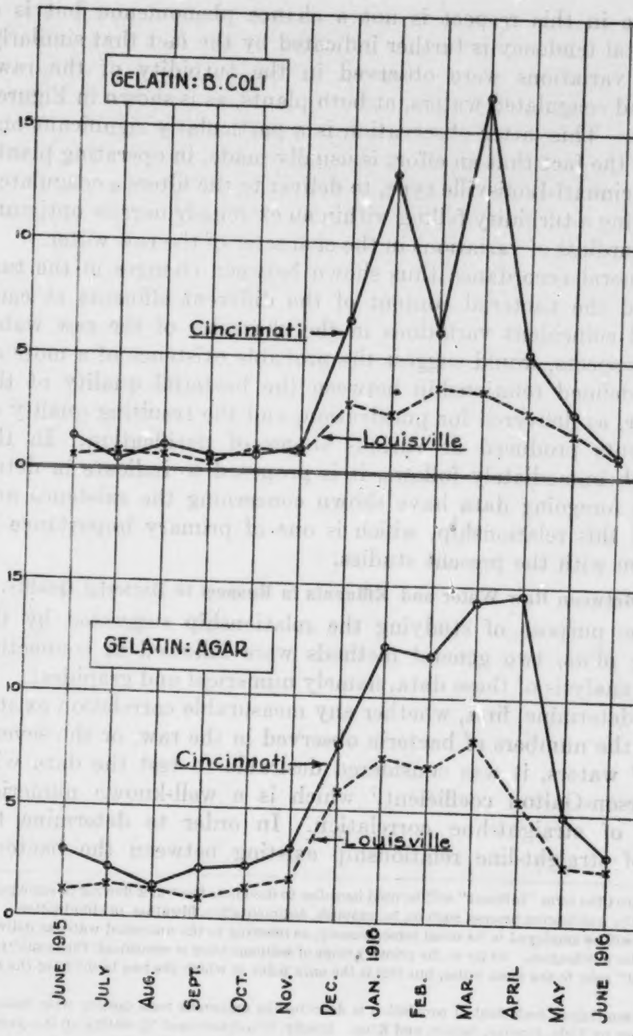

FIG. 5.

MONTHLY VARIATION IN GELATIN: AGAR AND GELATIN: B. COLI RATIOS IN RAW WATER AT CINCINNATI AND LOUISVILLE DURING PERIOD OF STUDY

Note: Gelatin and agar counts in numbers per c.c.
B. coli counts in numbers per 100 c.c.

consonance in this respect is not a chance phenomenon but is a fundamental tendency is further indicated by the fact that similarly harmonic variations were observed in the turbidity of the raw, settled, and coagulated waters, at both plants, as is shown in Figures 11 and 12. This latter observation is a particularly significant one in view of the fact that an effort is usually made, in operating plants of the Cincinnati-Louisville type, to deliver to the filters a coagulated water having a turbidity falling within an extremely narrow optimum range, regardless of variations in the character of the raw water.

The general accordance thus shown between changes in the turbidity and the bacterial content of the different effluents at each plant and coincident variations in the character of the raw water in these respects, would suggest the probable existence of a more or less well-defined relationship between the bacterial quality of the raw water, as delivered for purification, and the resulting quality of the effluents produced at various stages of purification. In the text which immediately follows, it is proposed to indicate in detail what the foregoing data have shown concerning the existence and nature of this relationship, which is one of primary importance in connection with the present studies.

Relations Between Raw Water and Effluents in Respect to Bacterial Quality.

For the purpose of studying the relationship suggested by the foregoing plots, two general methods were followed in connection with the analysis of these data, namely numerical and graphical. In order to determine, first, whether any measurable correlation existed between the numbers of bacteria observed in the raw, or the several influent,[6] waters, it was considered desirable to test the data with the Pearson-Galton coefficient,[7] which is a well-known numerical measure of straight-line correlation. In order to determine the extent of straight-line relationship existing between the bacterial

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[6] In this report the term "influent" will be used hereafter to designate the water flowing to some particular stage of the purification process, such as, for example, sedimentation, filtration, or chlorination. The term "raw" will be employed in its usual sense, namely, as referring to the untreated water as delivered to the plant for purification. As far as the primary stage of sedimentation is concerned, the terms "raw" and "influent" refer to the same water, but this is the only point at which the two terms have the same significance.

[7] The Pearson-Galton coefficient of correlation is described in numerous texts dealing with statistics, including those by Yule, Bowley, Secrist, and King. Briefly, it is determined by setting up the standard deviations (σ_1) and (σ_2) of the two variables with reference to their respective means and computing the coefficient of correlation r by the formula:

$$r = \frac{\Sigma xy}{\sqrt{\Sigma x^2 \, \Sigma y^2}} = \frac{\Sigma xy}{n \sigma_1 \sigma_2},$$

where x and y represent the deviations of individual items of the two variables from their means, and n the number of pairs of items. The standard deviations are:

$$\sigma_1 = \sqrt{\frac{\Sigma x^2}{n}} \text{ and } \sigma_2 = \sqrt{\frac{\Sigma y^2}{n}}$$

The value of r may range between zero and unity, the former representing no correlation and the latter perfect correlation. King states that a value of r less than 0.3 is usually taken to indicate little or no correlation, whereas a value greater than 0.5 shows decided correlation. It should be borne in mind, however, that this coefficient is a direct measure only of straight-line correlation.

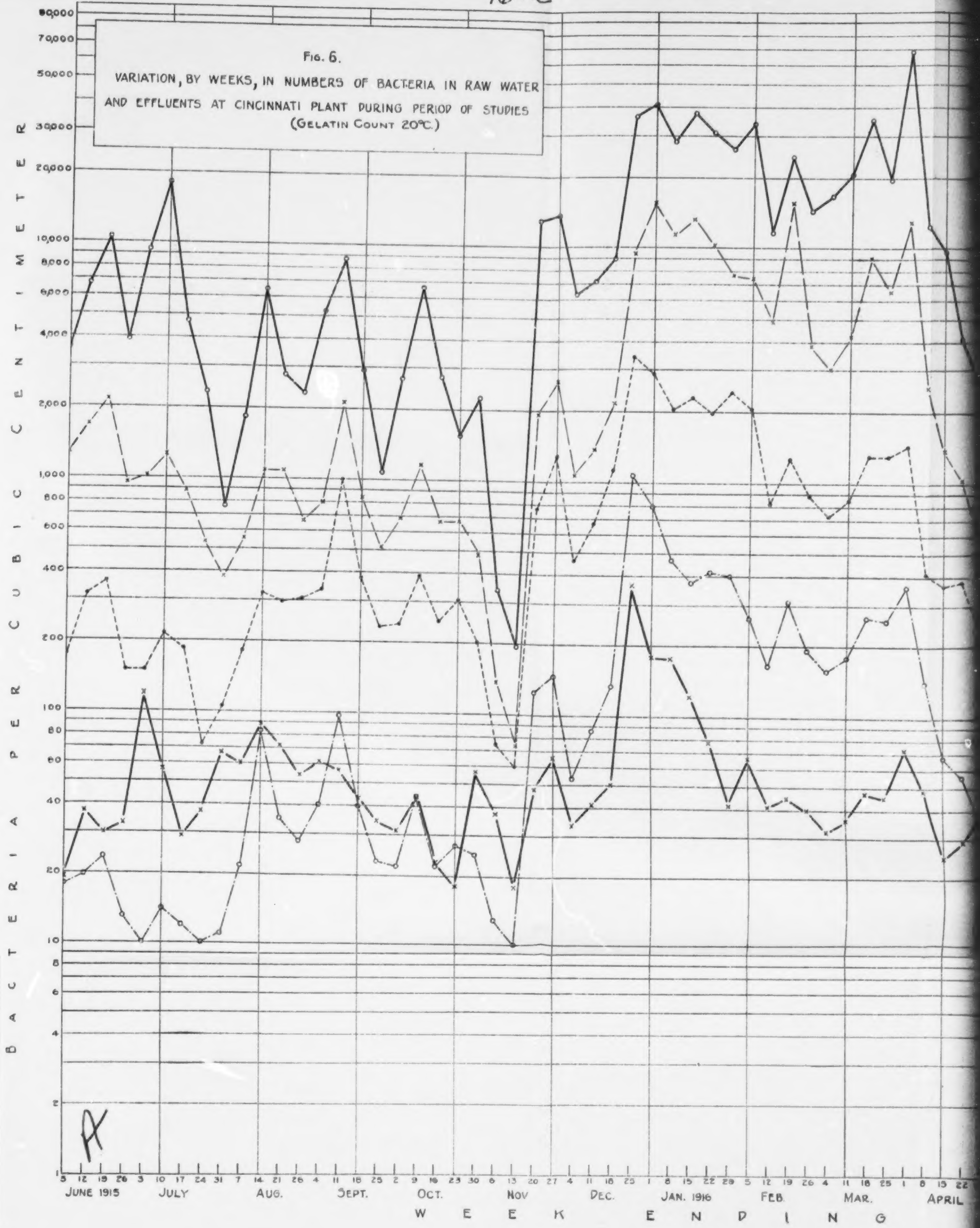
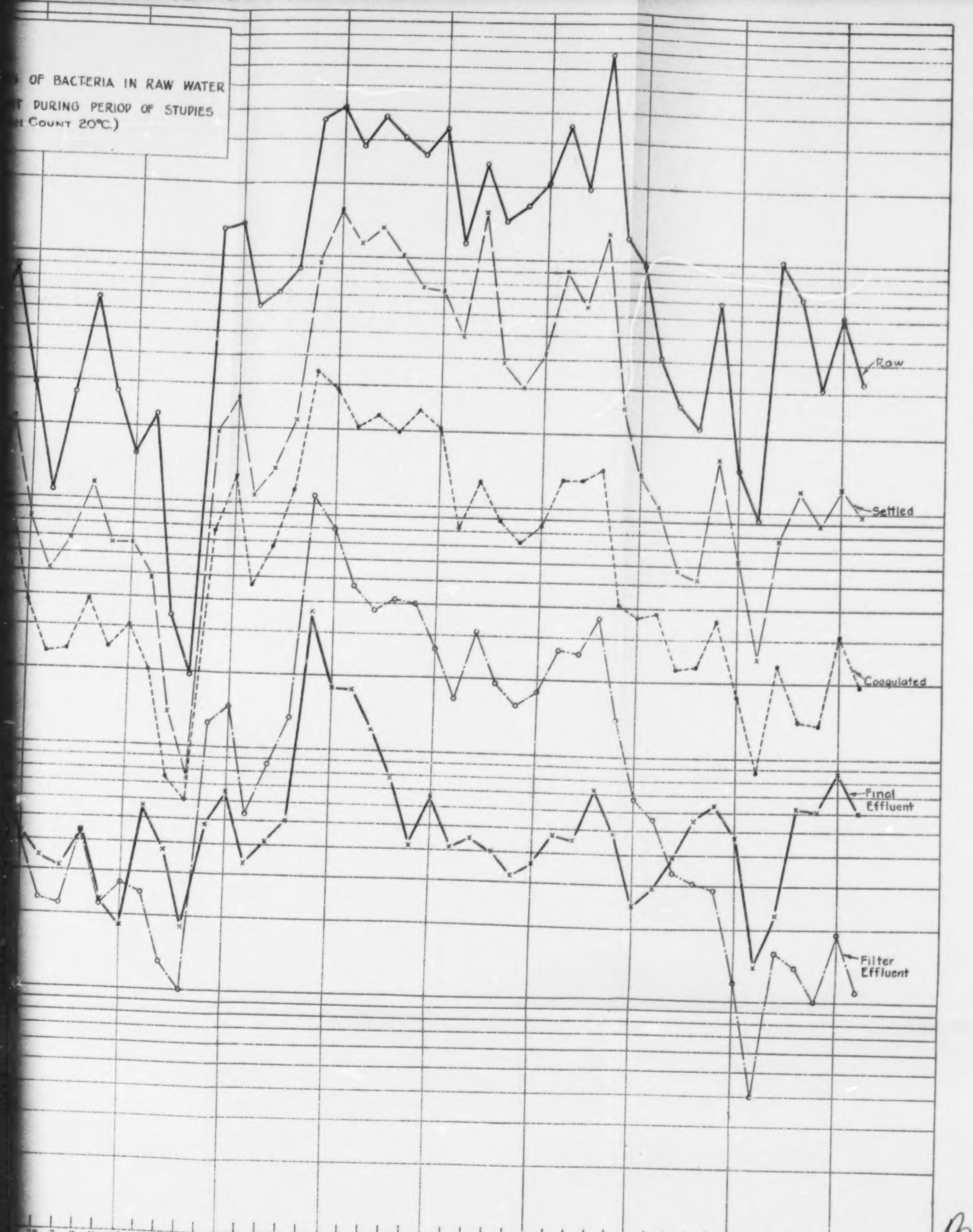


Fig. 6.

VARIATION, BY WEEKS, IN NUMBERS OF BACTERIA IN RAW WATER AND EFFLUENTS AT CINCINNATI PLANT DURING PERIOD OF STUDIES
(Gelatin Count 20°C.)

16-a



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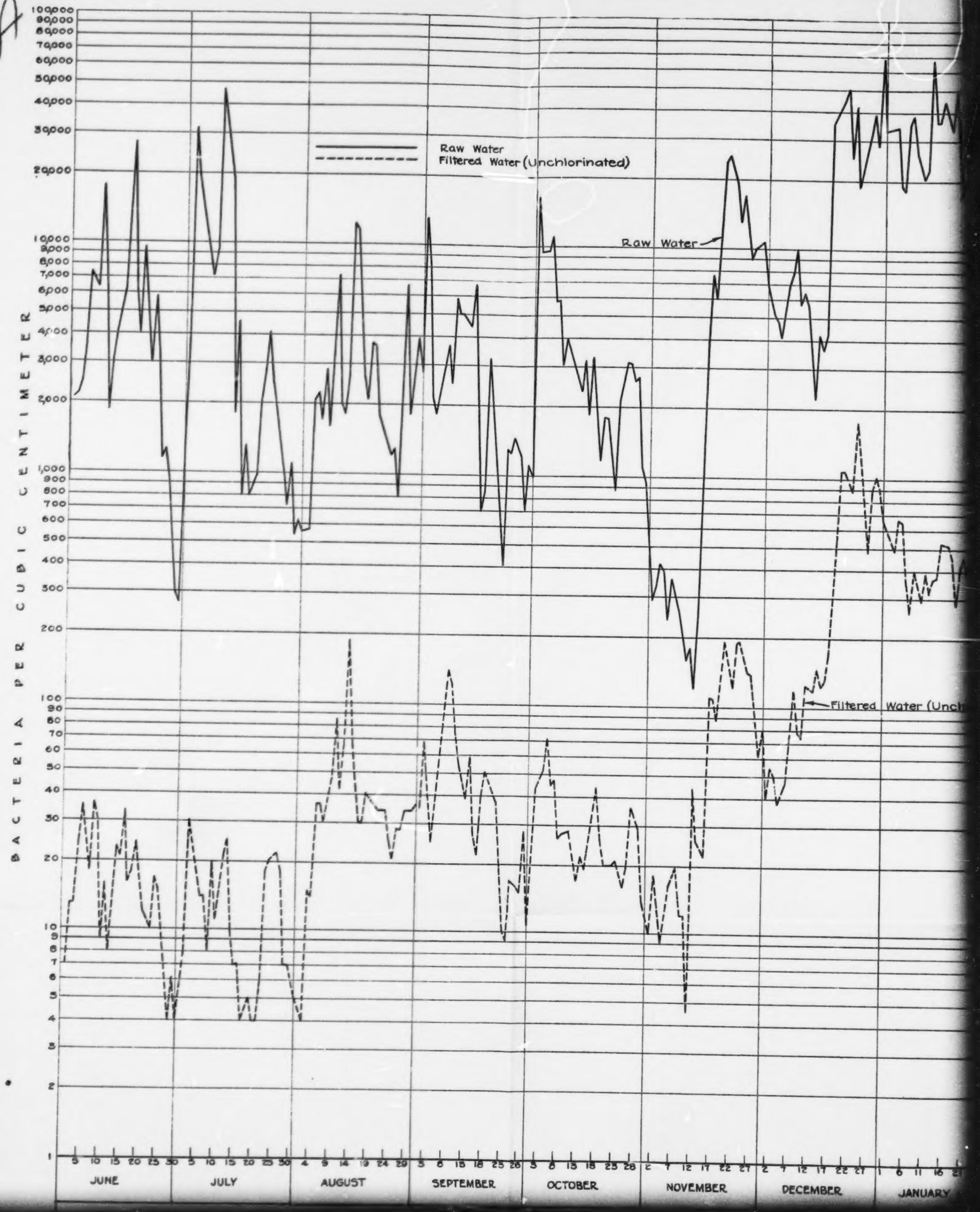
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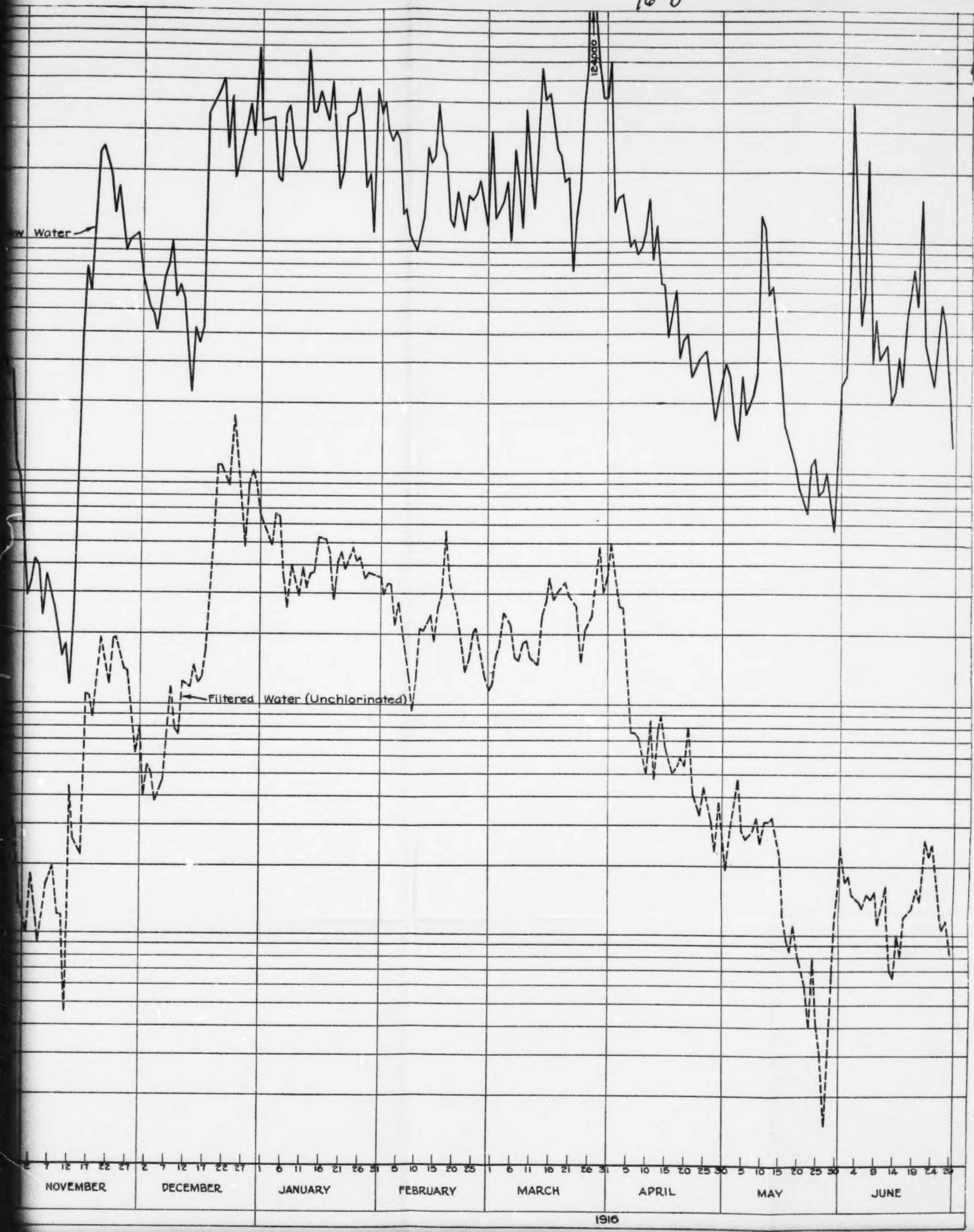
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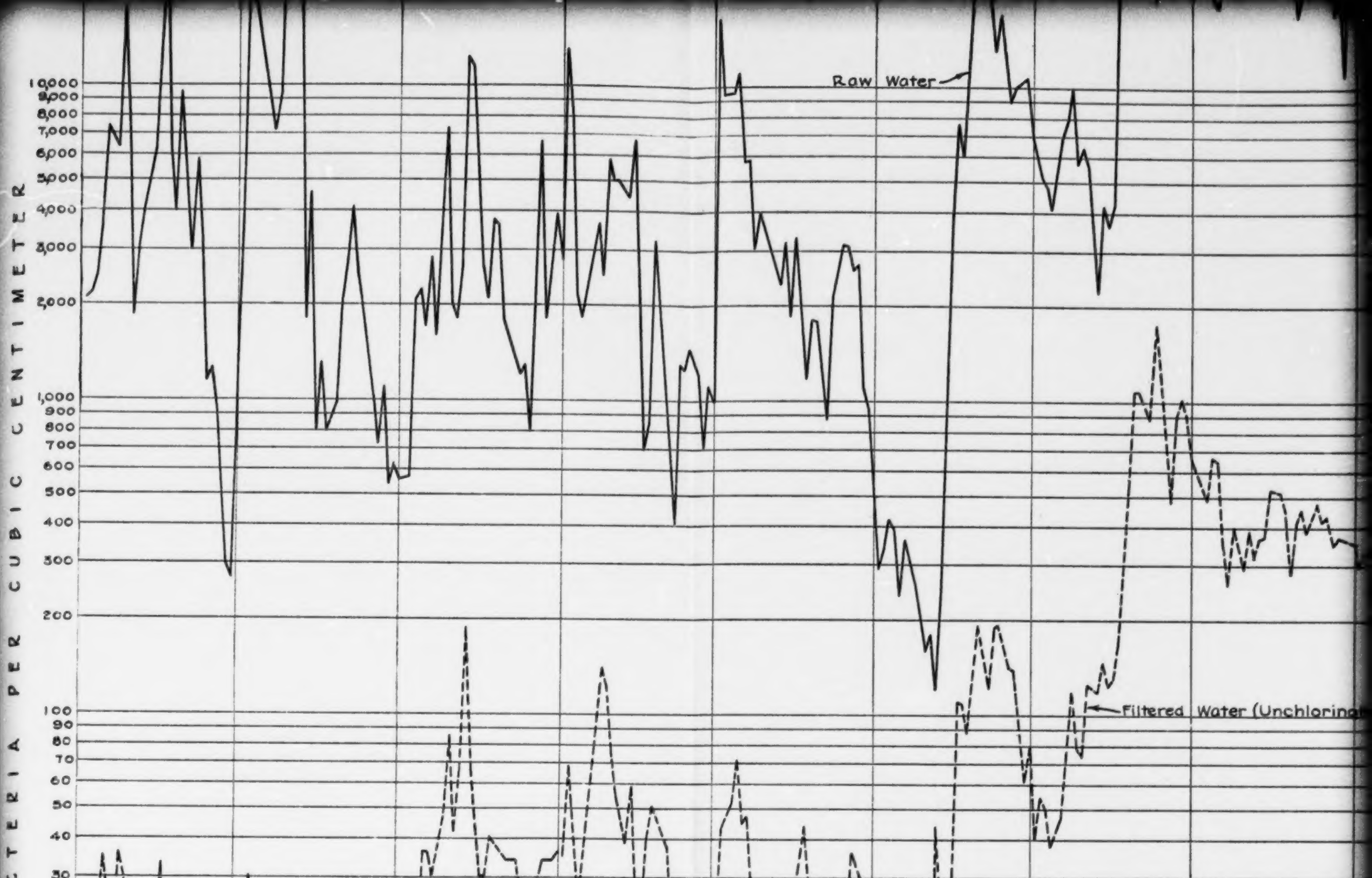

Fig. 7.

DAILY VARIATION IN NUMBERS OF BACTERIA IN RAW A
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(Gelatin, 20°C.)

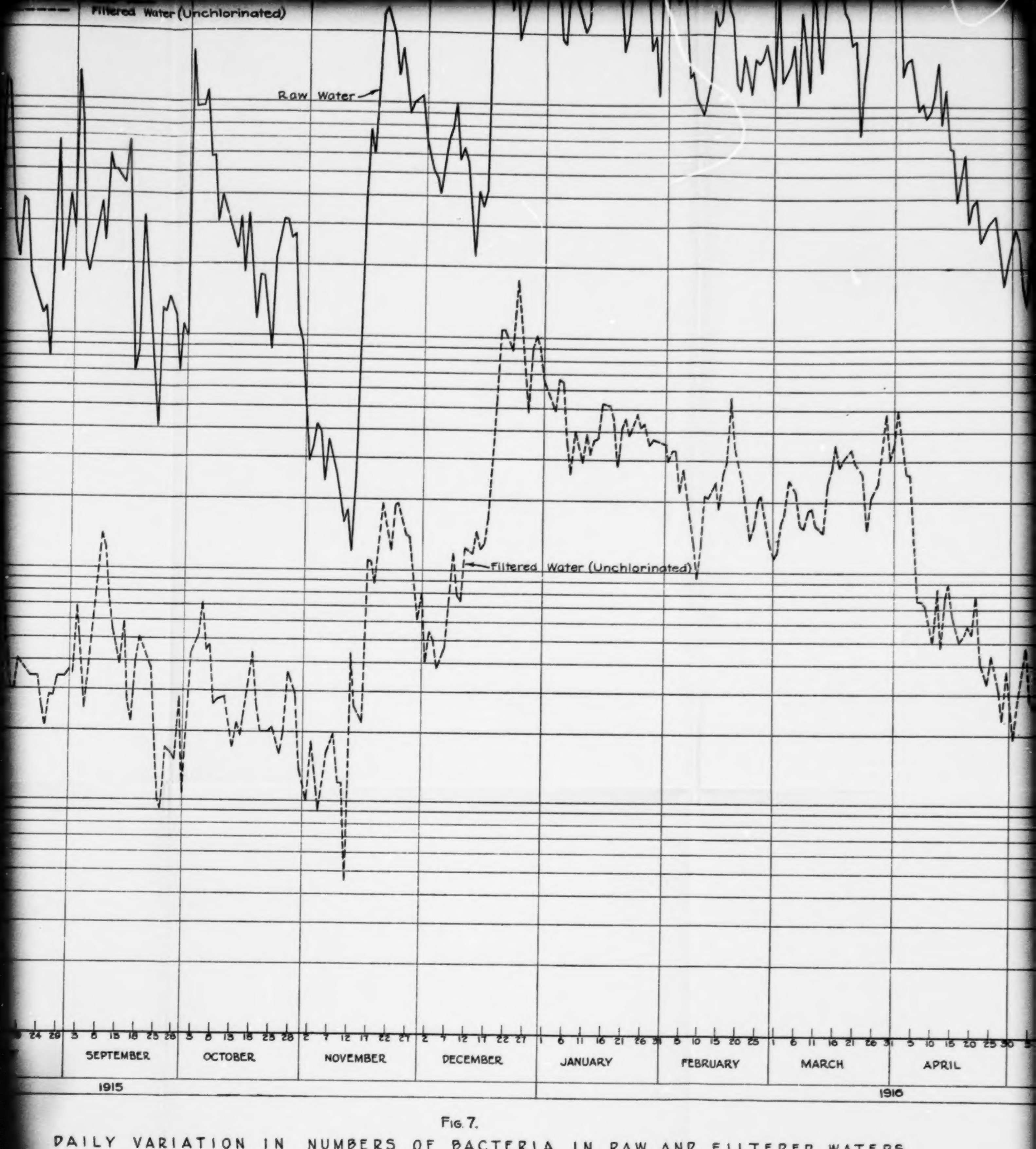

Fig. 7.

DAILY VARIATION IN NUMBERS OF BACTERIA IN RAW AND FILTERED WATERS AT CINCINNATI FILTRATION PLANT DURING PERIOD OF JUNE, 1915 TO JUNE, 1916, INCLUSIVE

(Gelatin, 20°C.)

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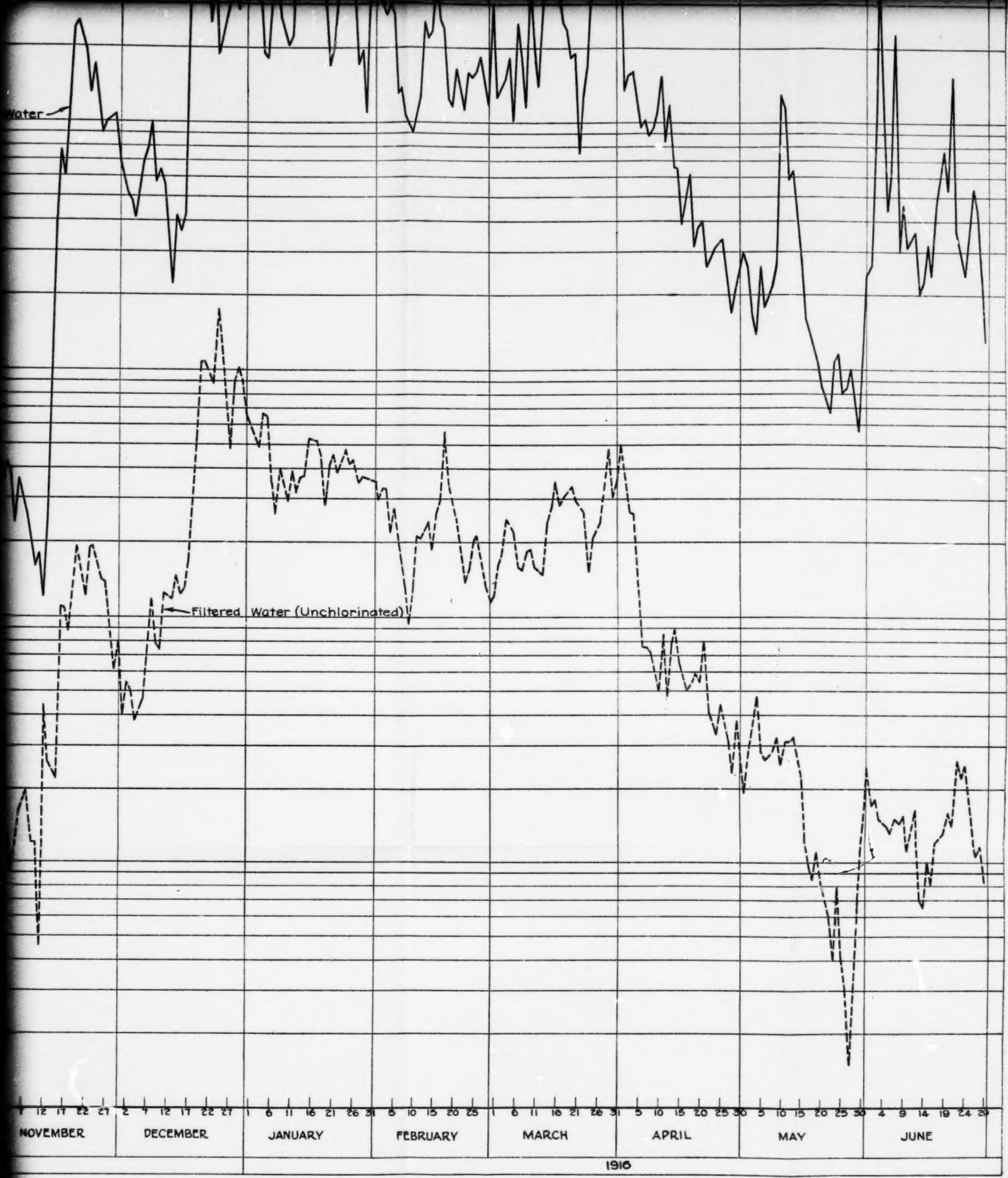

Fig. 7.

UMBERS OF BACTERIA IN RAW AND FILTERED WATERS
FILTRATION PLANT DURING PERIOD OF
1915 TO JUNE, 1916, INCLUSIVE
(Gelatin, 20°C.)

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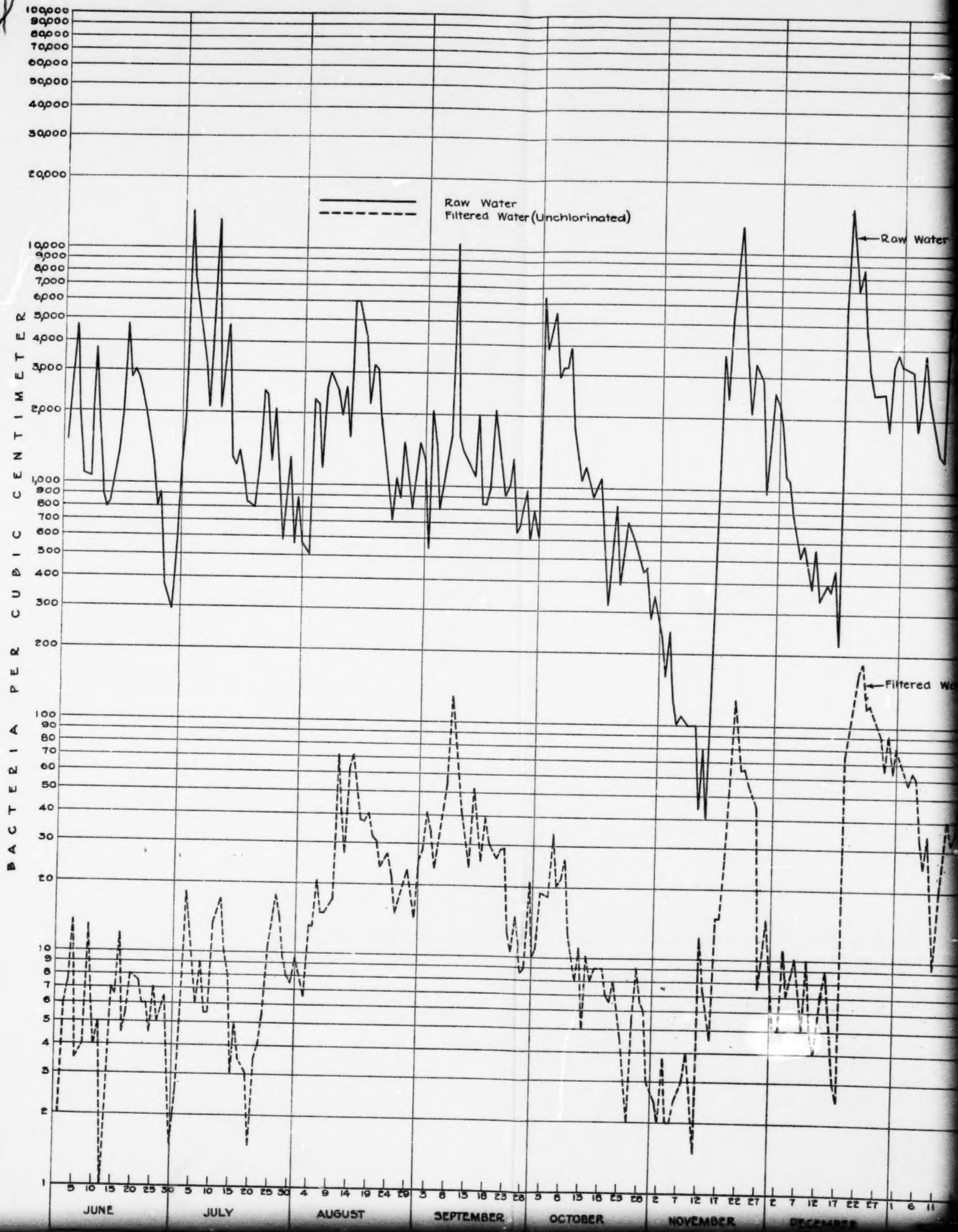

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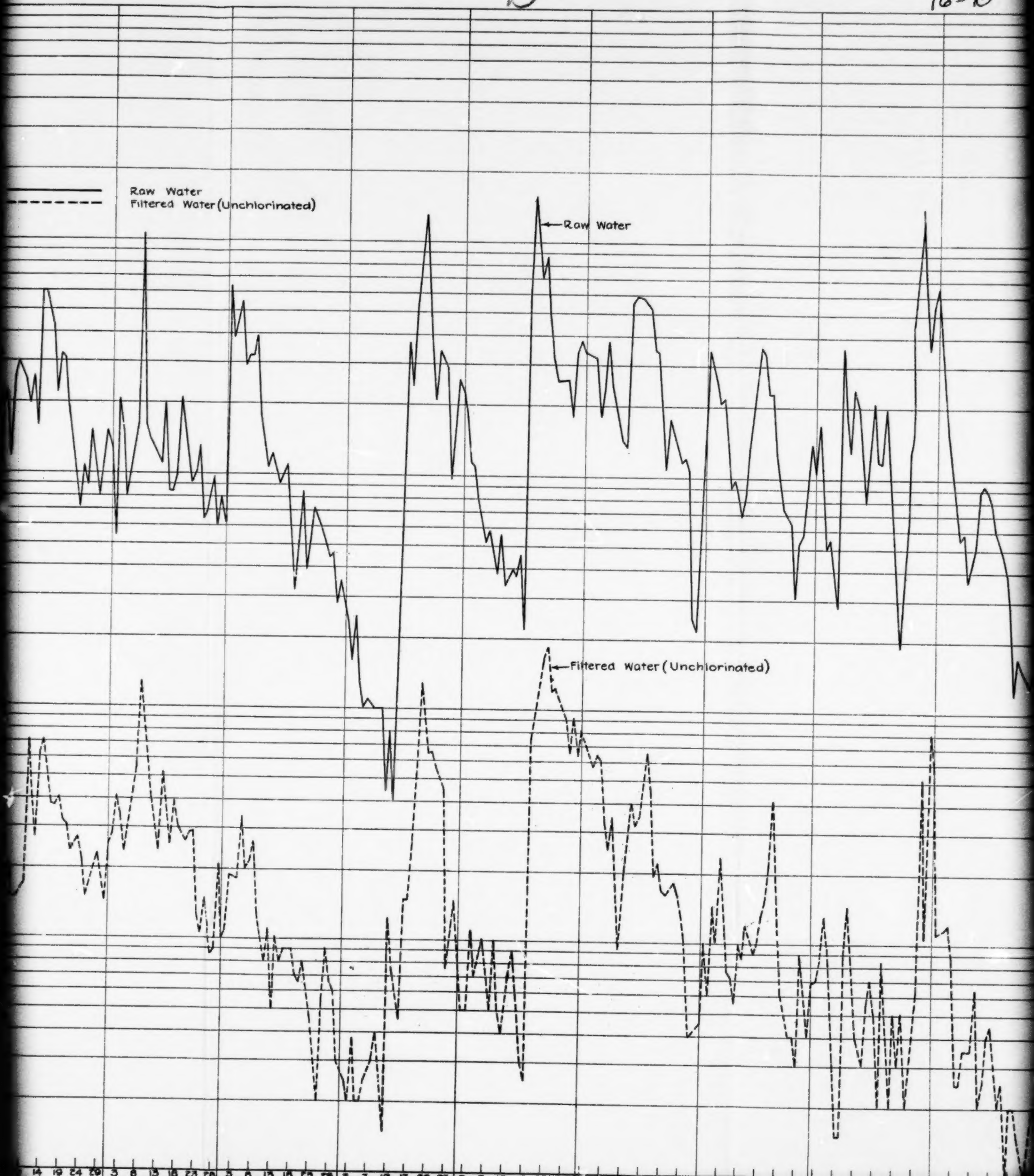
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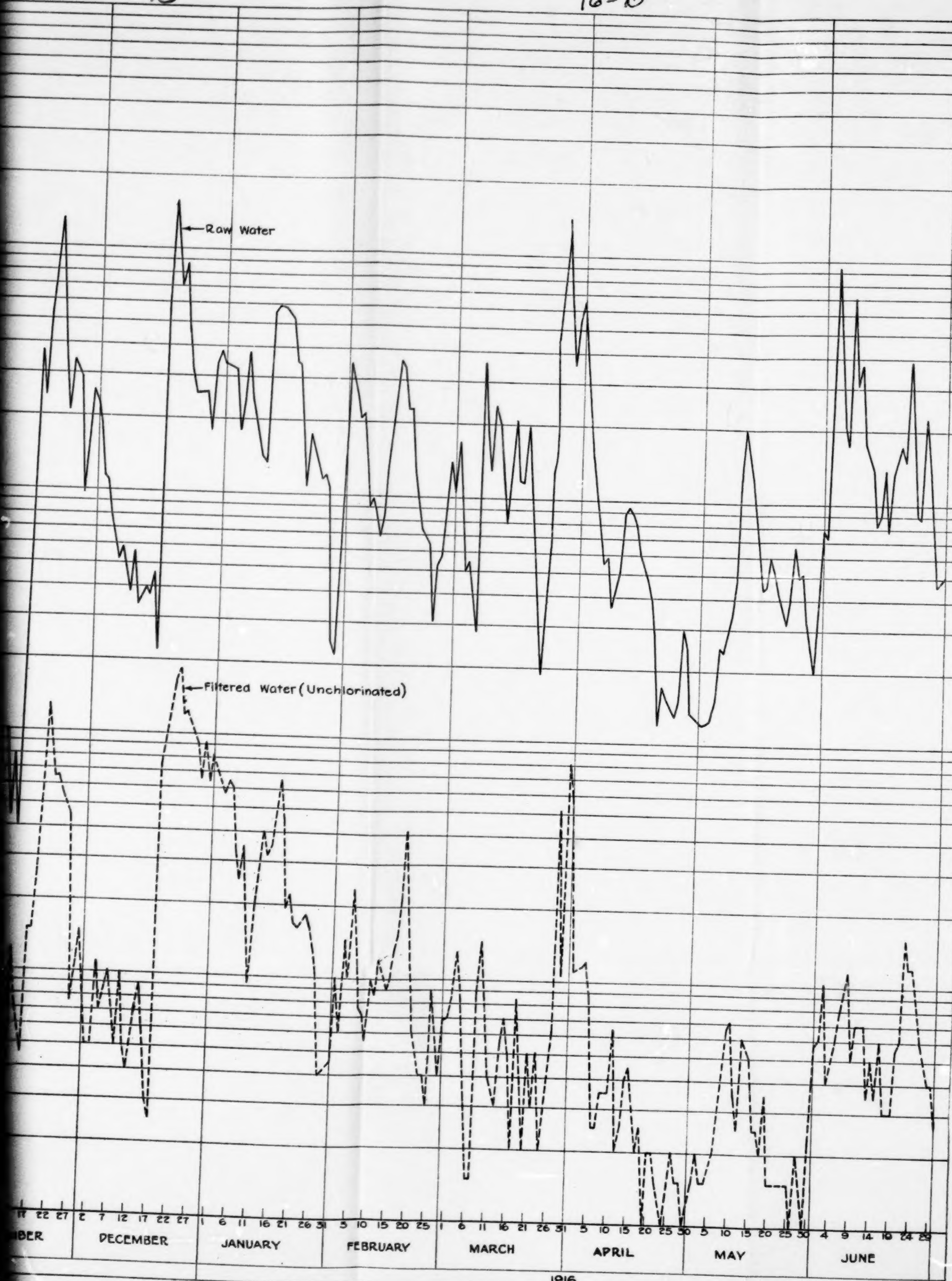

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Fig. 8.

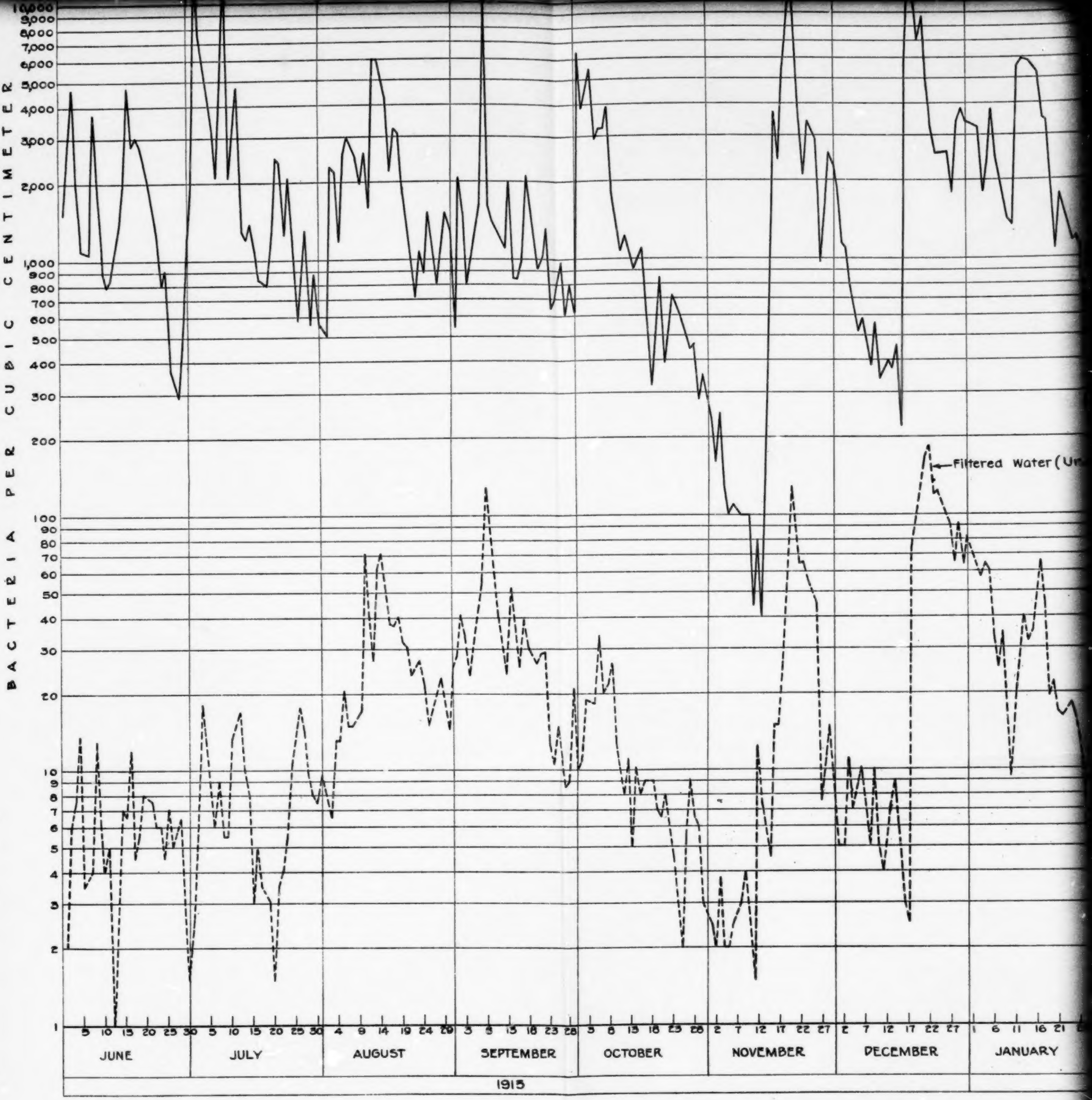

FIG. 8.

DAILY VARIATION IN NUMBERS OF BACTERIA IN RAW
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(Agar, 37°C.)

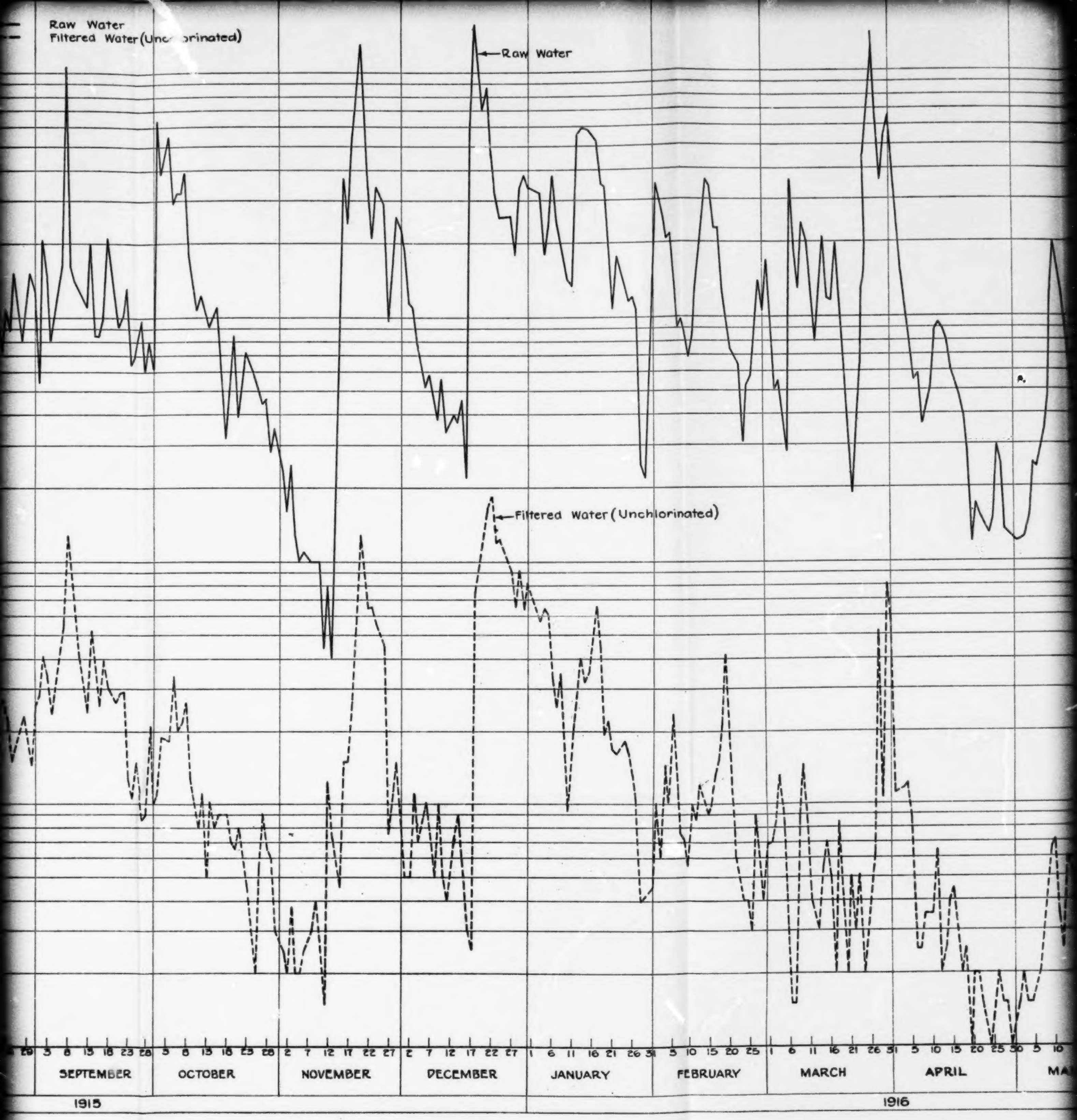

Fig. 8.

DAILY VARIATION IN NUMBERS OF BACTERIA IN RAW AND FILTERED WATERS AT CINCINNATI FILTRATION PLANT DURING PERIOD OF JUNE, 1915 TO JUNE, 1916, INCLUSIVE (Agar, 37°C.)

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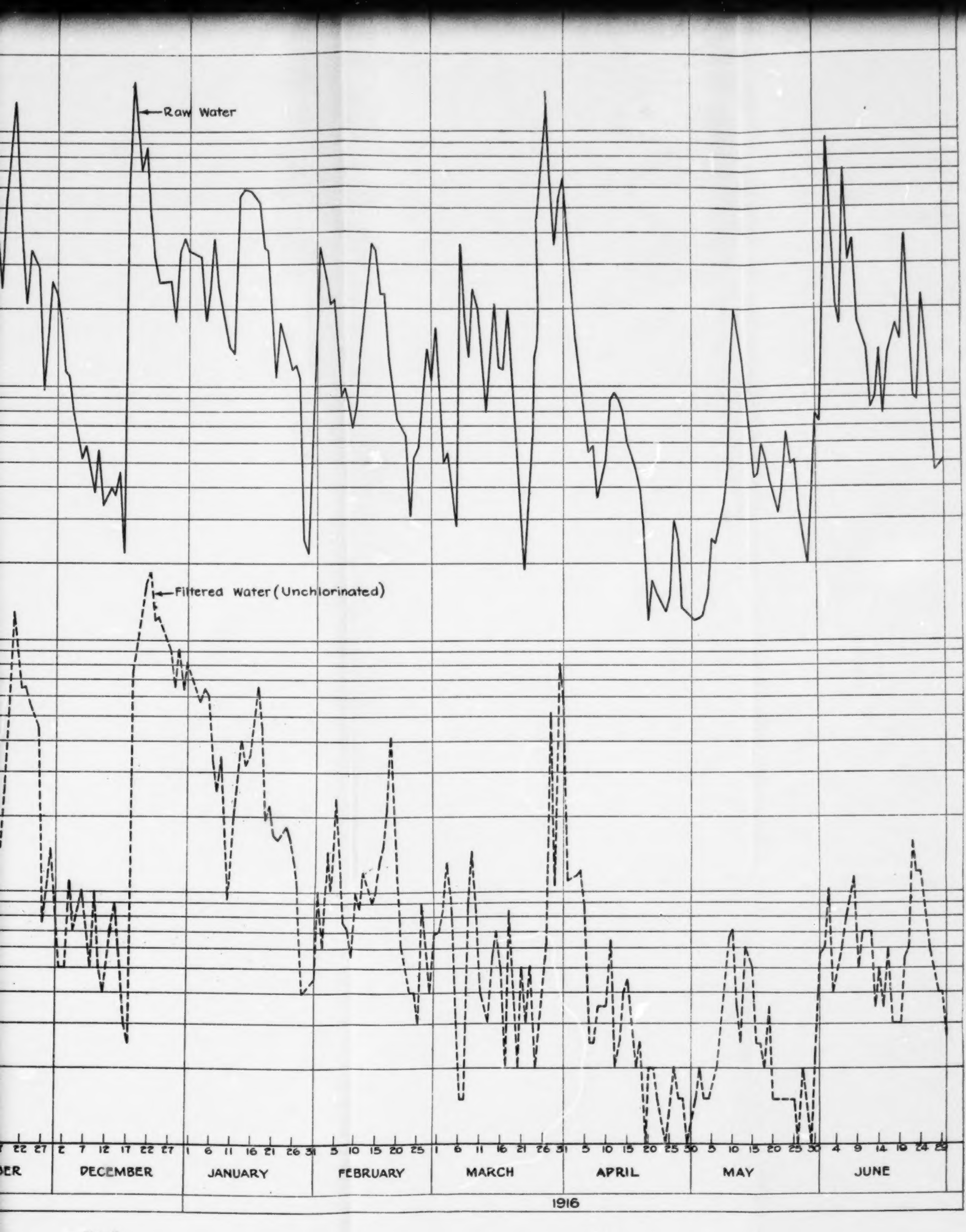

FIG. 8.

RS OF BACTERIA IN RAW AND FILTERED WATERS
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(Agar, 37°C.)

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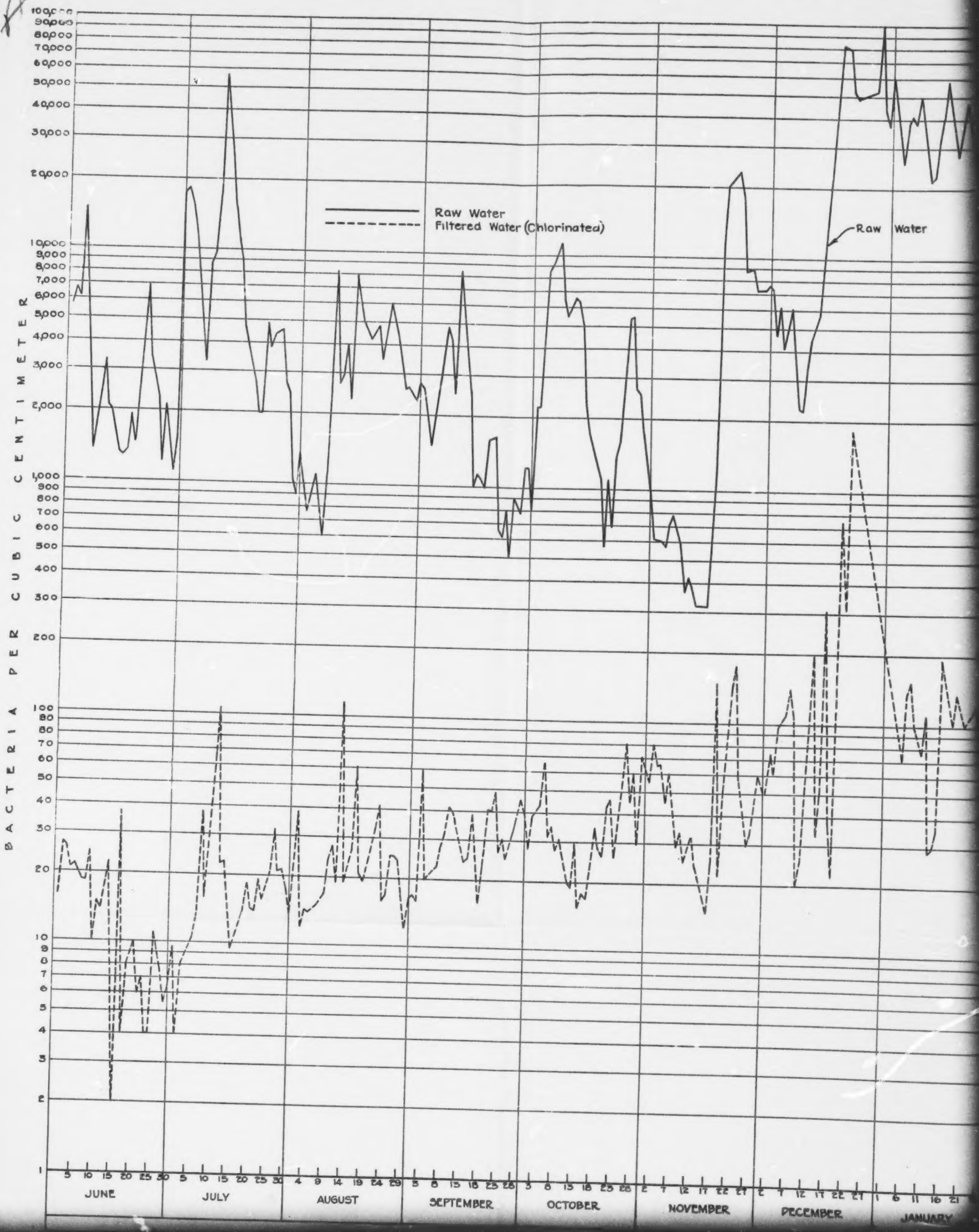
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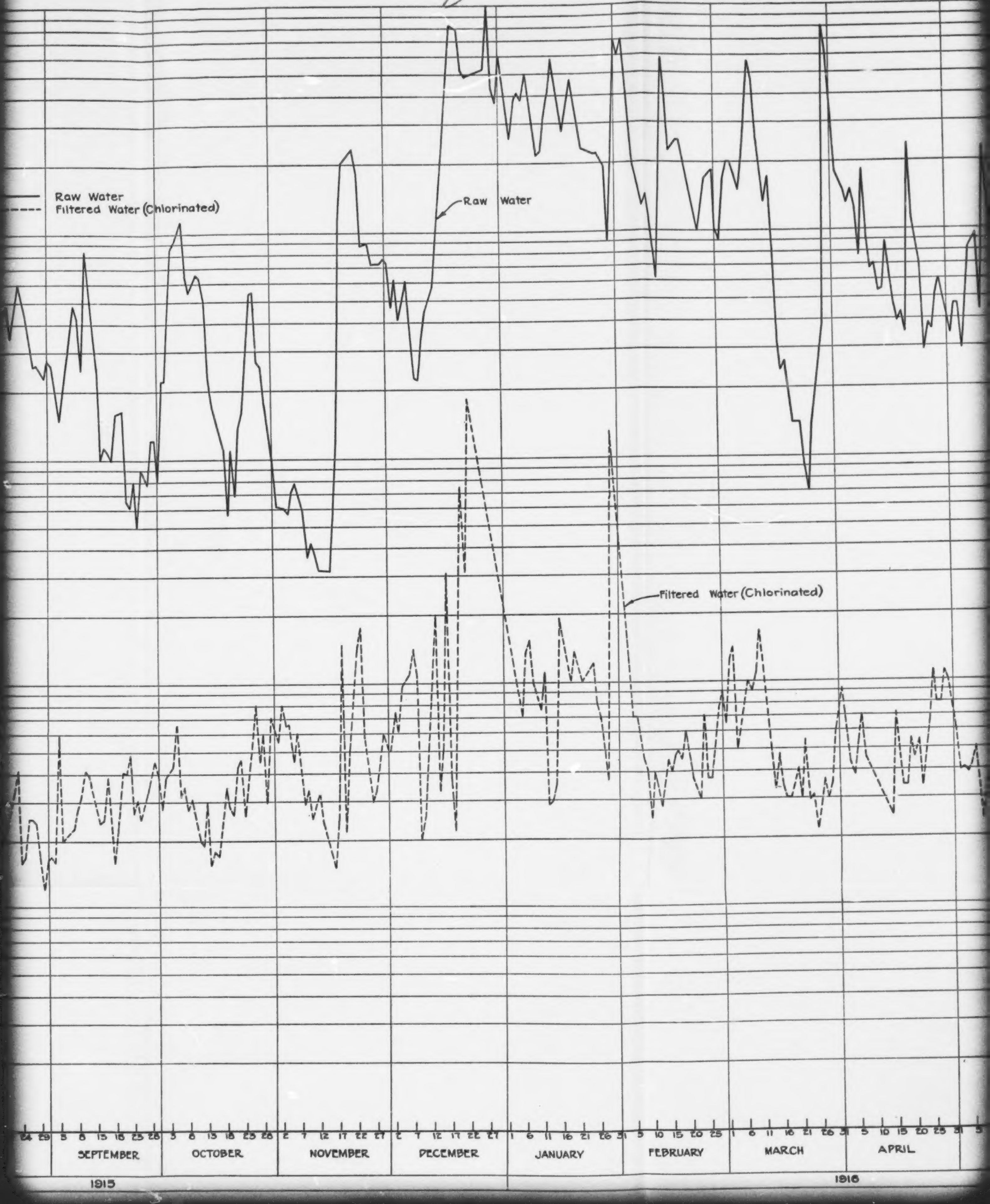
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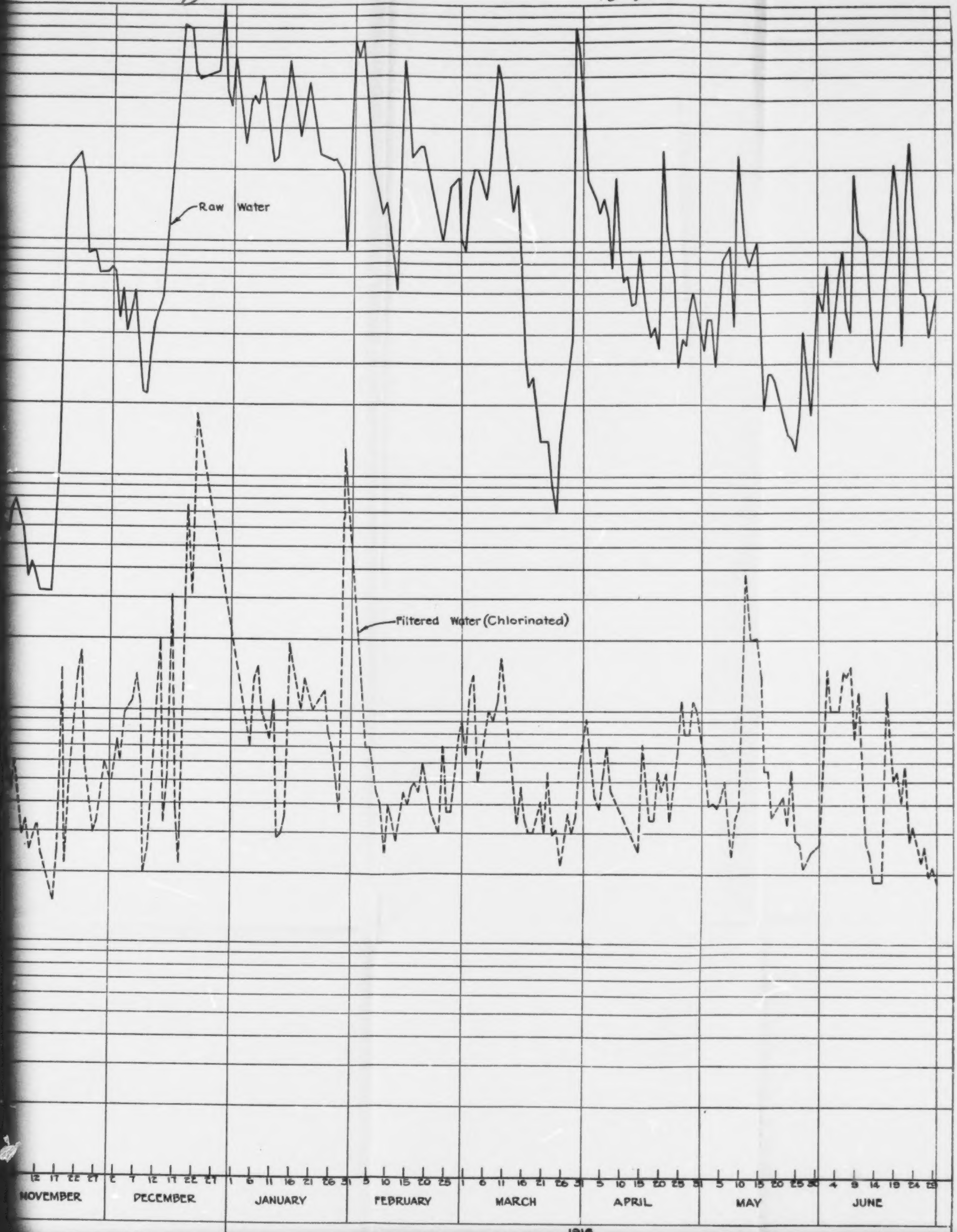
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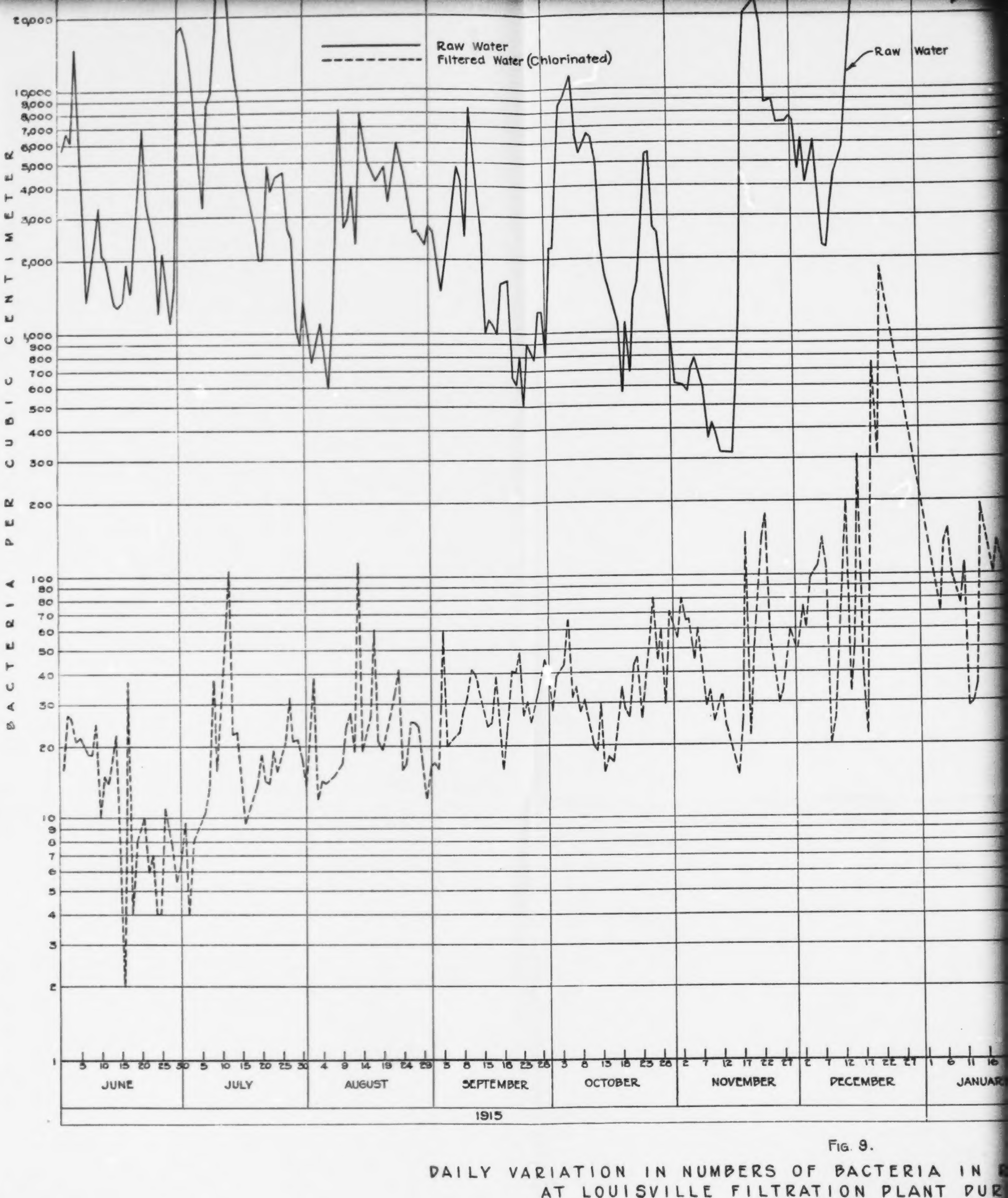

FIG. 9.

DAILY VARIATION IN NUMBERS OF BACTERIA IN
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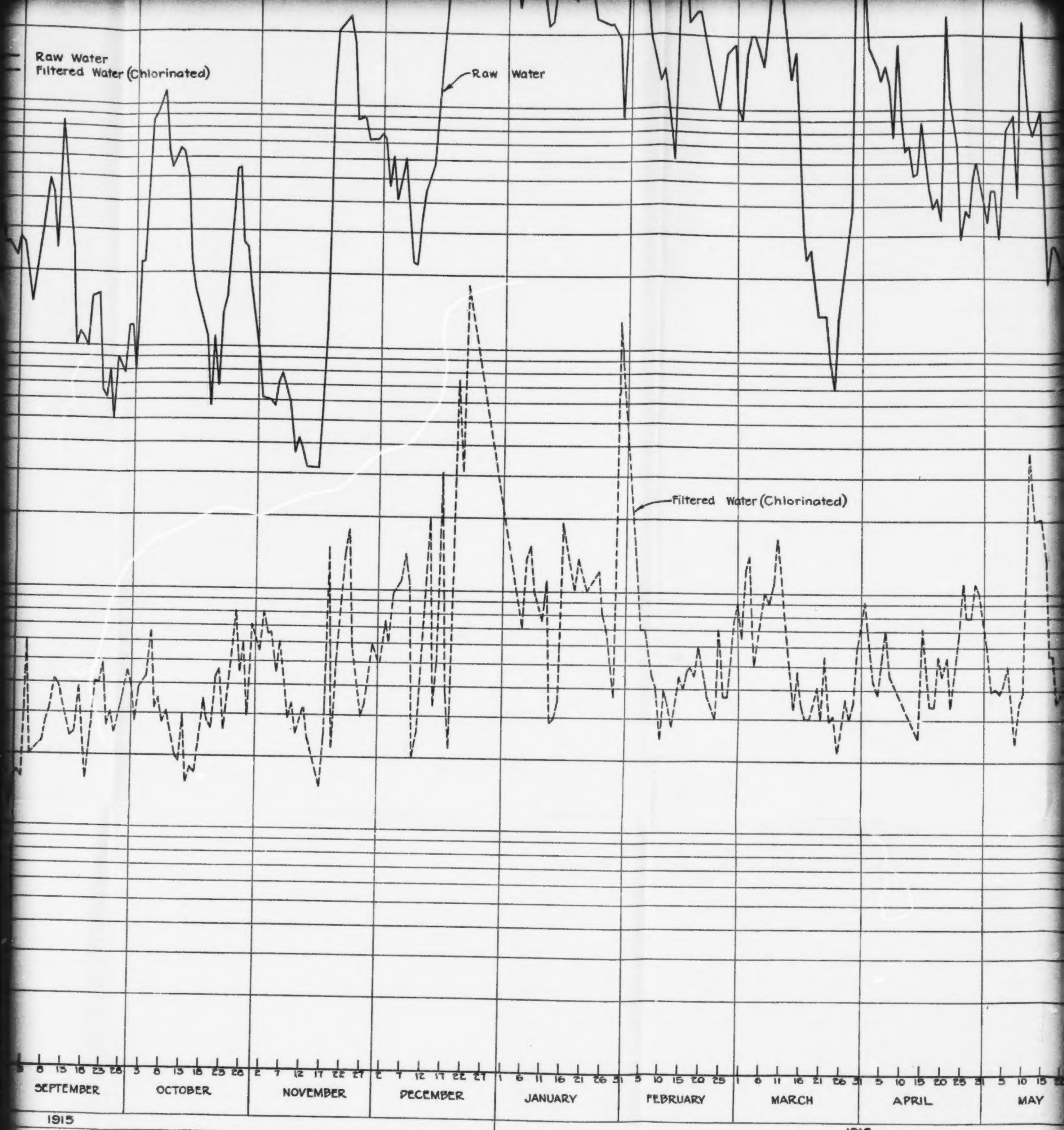

Fig. 9.

ILY VARIATION IN NUMBERS OF BACTERIA IN RAW AND FILTERED WATERS AT LOUISVILLE FILTRATION PLANT DURING PERIOD OF JUNE, 1915 TO JUNE, 1916, INCLUSIVE (Gelatin; 20° C.)

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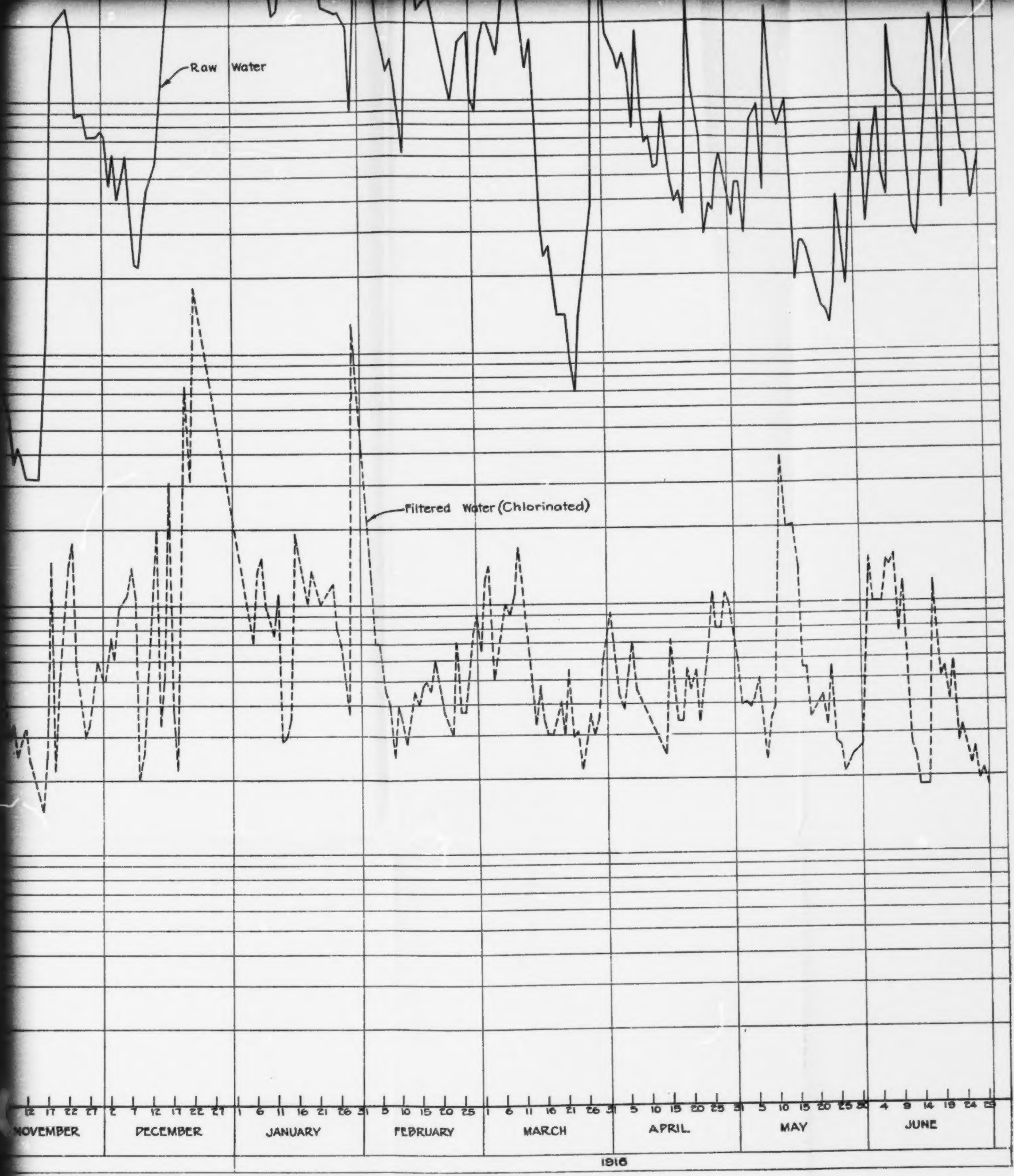

FIG. 9.

MBERS OF BACTERIA IN RAW AND FILTERED WATERS
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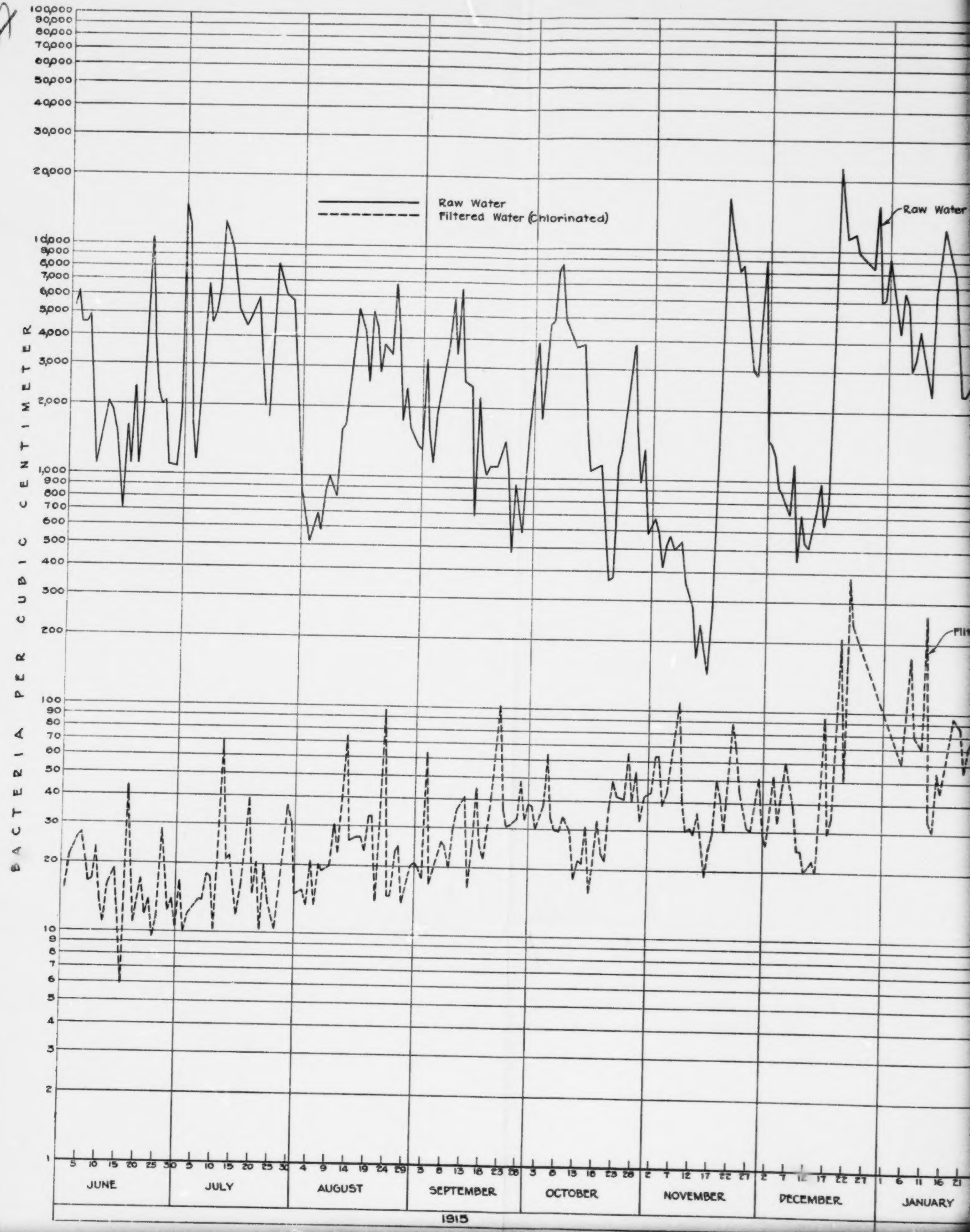
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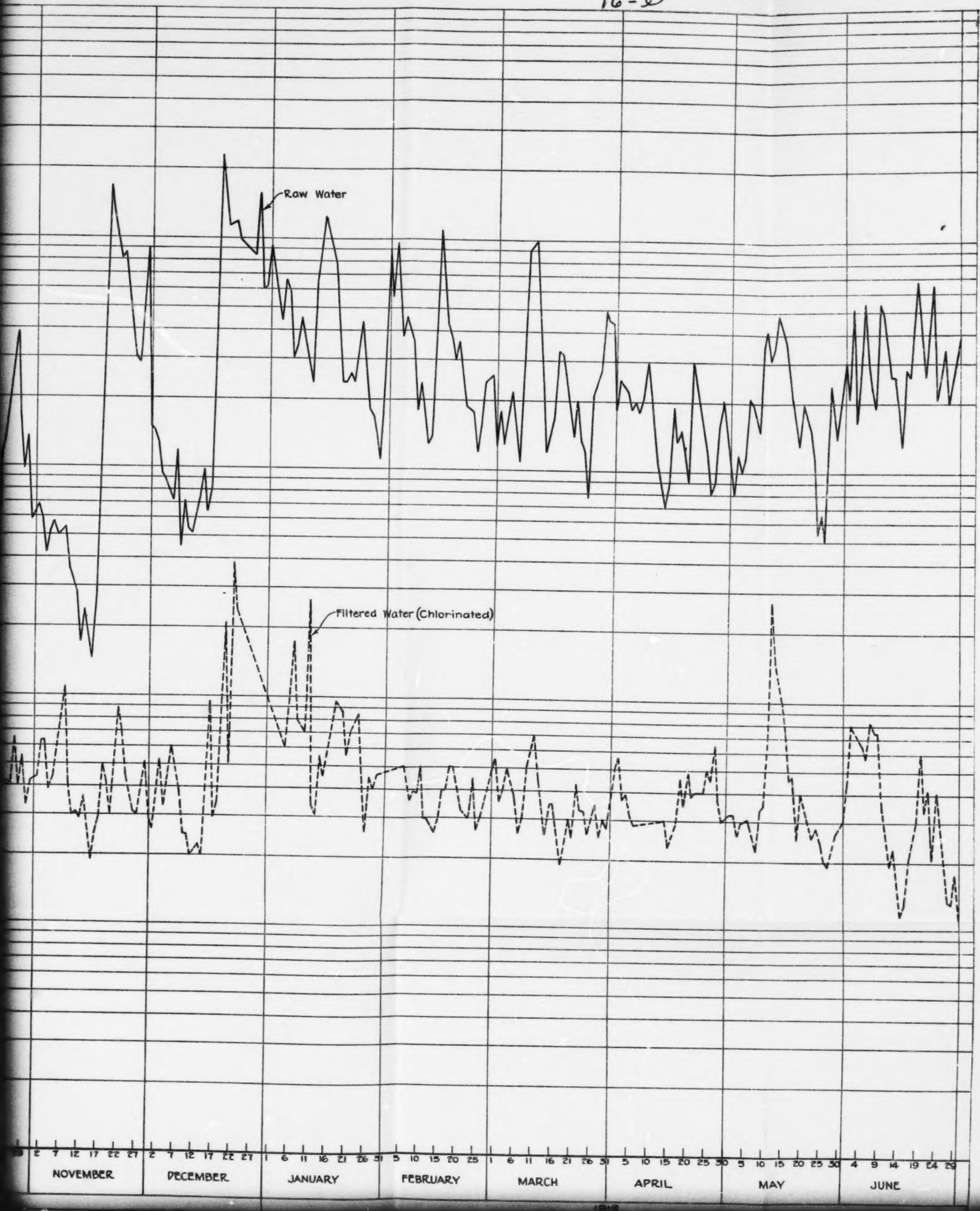

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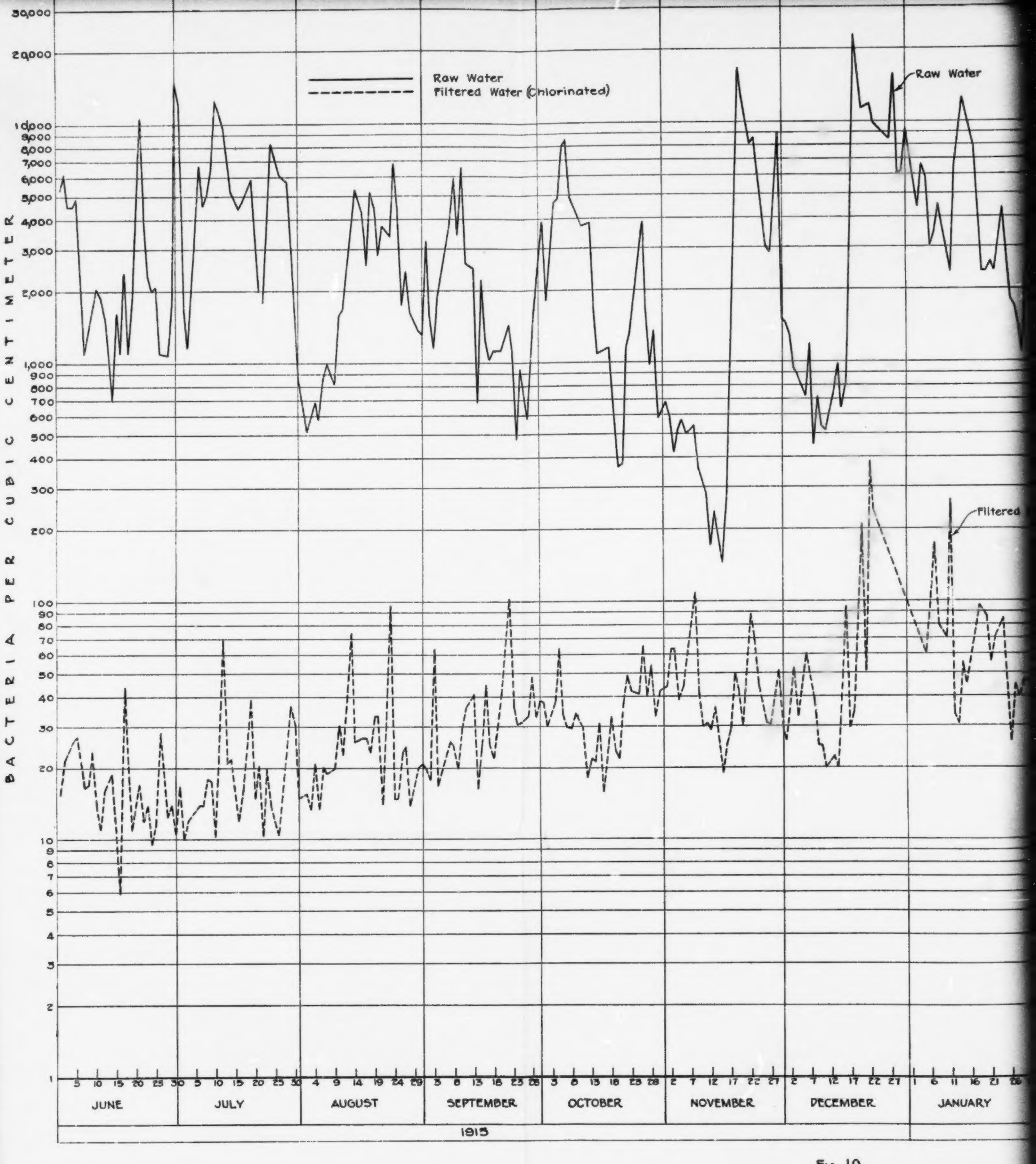

FIG. 10

DAILY VARIATION IN NUMBERS OF BACTERIA IN RAW
AT LOUISVILLE FILTRATION PLANT DURING
JUNE, 1915 TO JUNE, 1916, INCLUSI
(Agar, 37°C)

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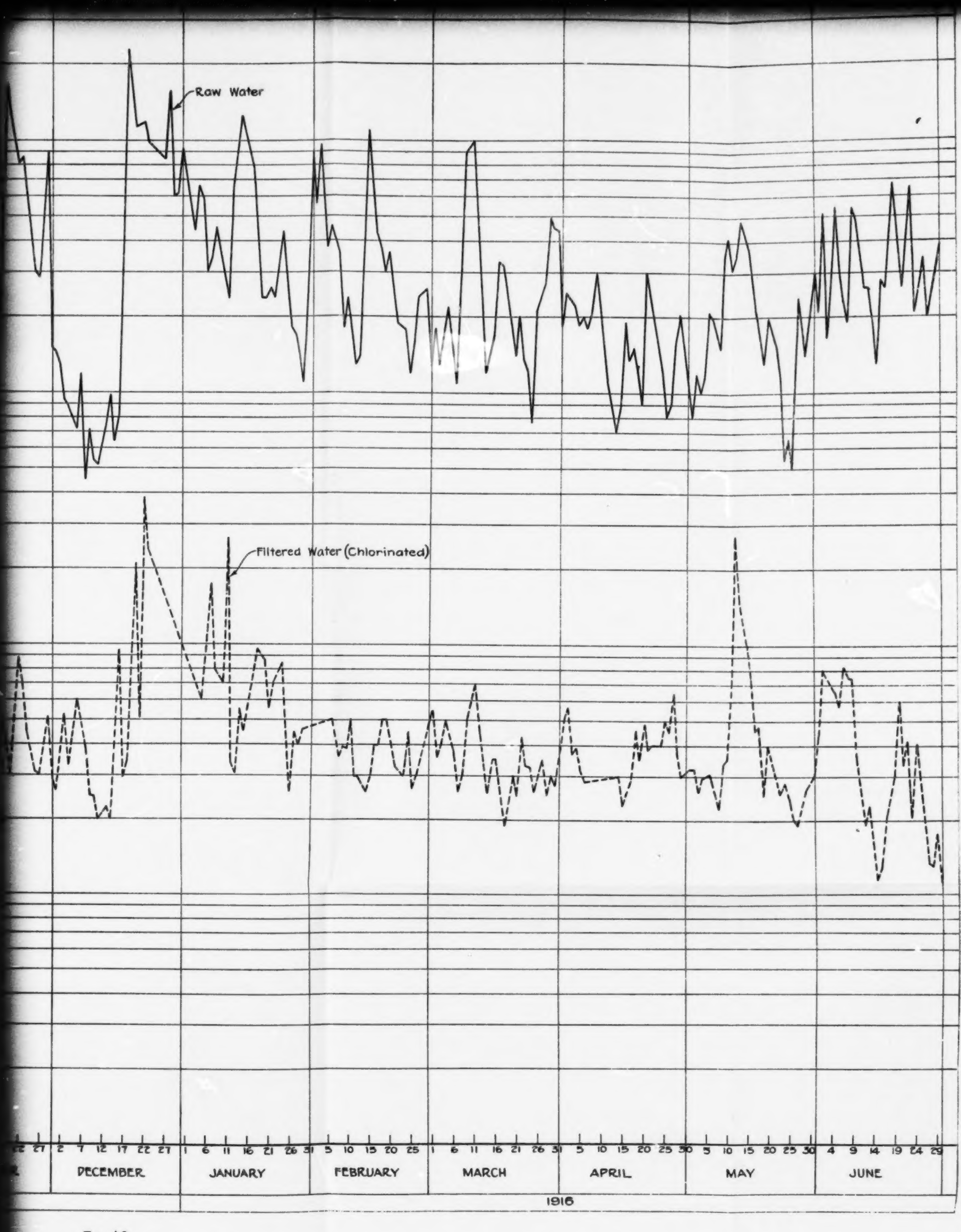

FIG. 10

S OF BACTERIA IN RAW AND FILTERED WATERS
TRATION PLANT DURING PERIOD OF
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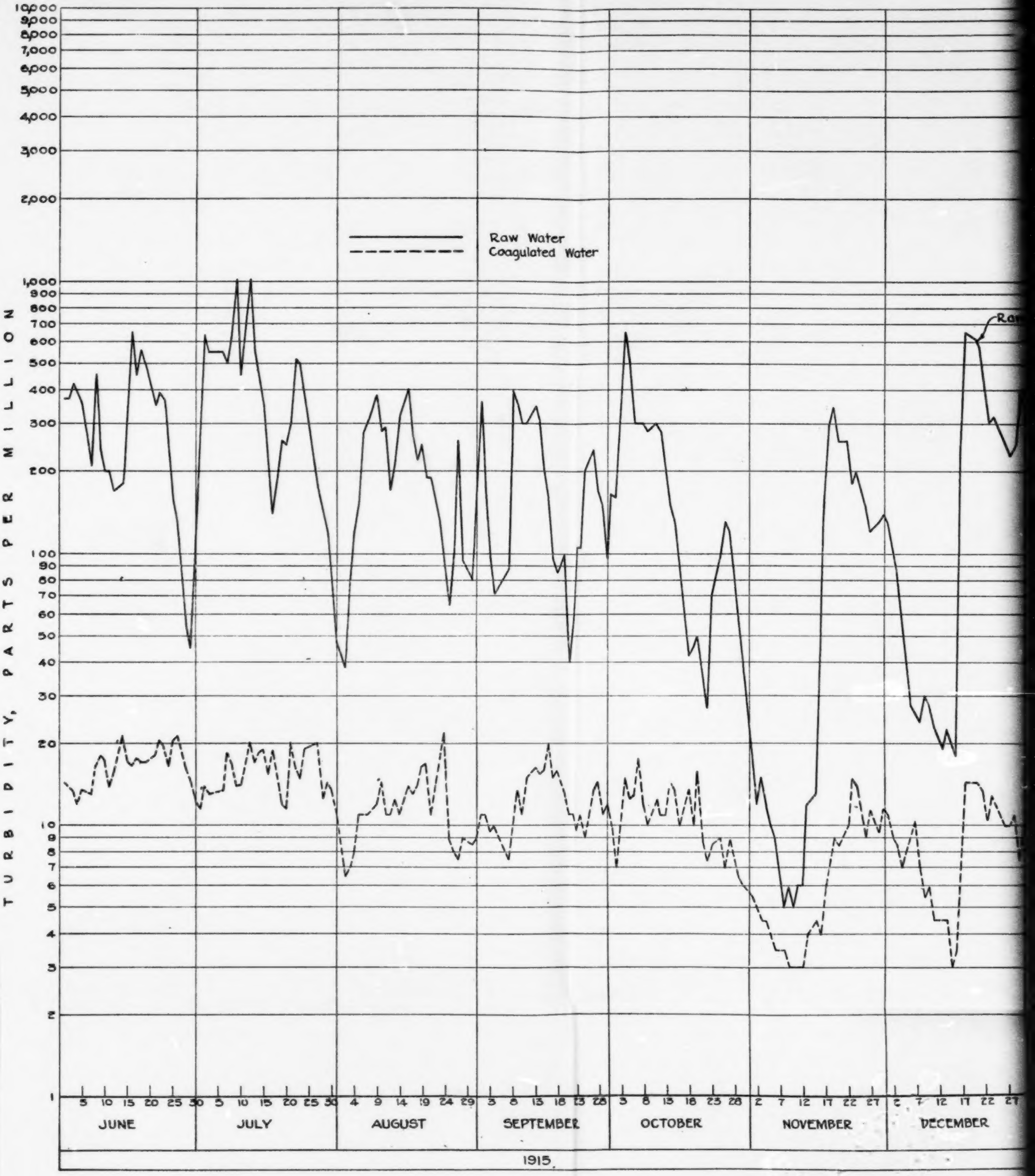

Fig. 11

DAILY VARIATION IN TURBIDITY OF R
AT CINCINNATI FILTRATION PLA
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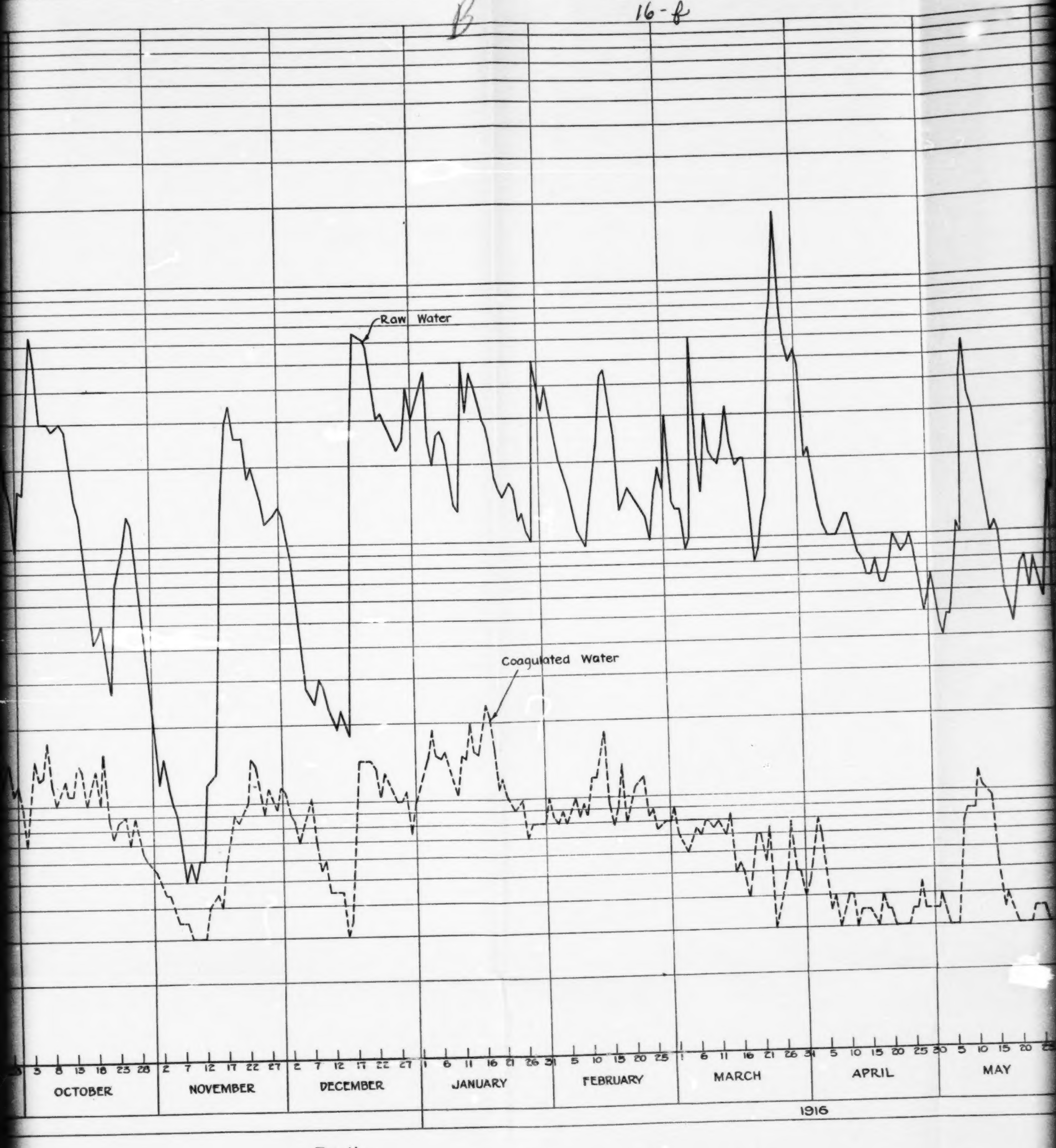

FIG. 11

VARIATION IN TURBIDITY OF RAW AND COAGULATED WATERS
T CINCINNATI FILTRATION PLANT DURING PERIOD OF
JUNE, 1915 TO JUNE, 1916, INCLUSIVE

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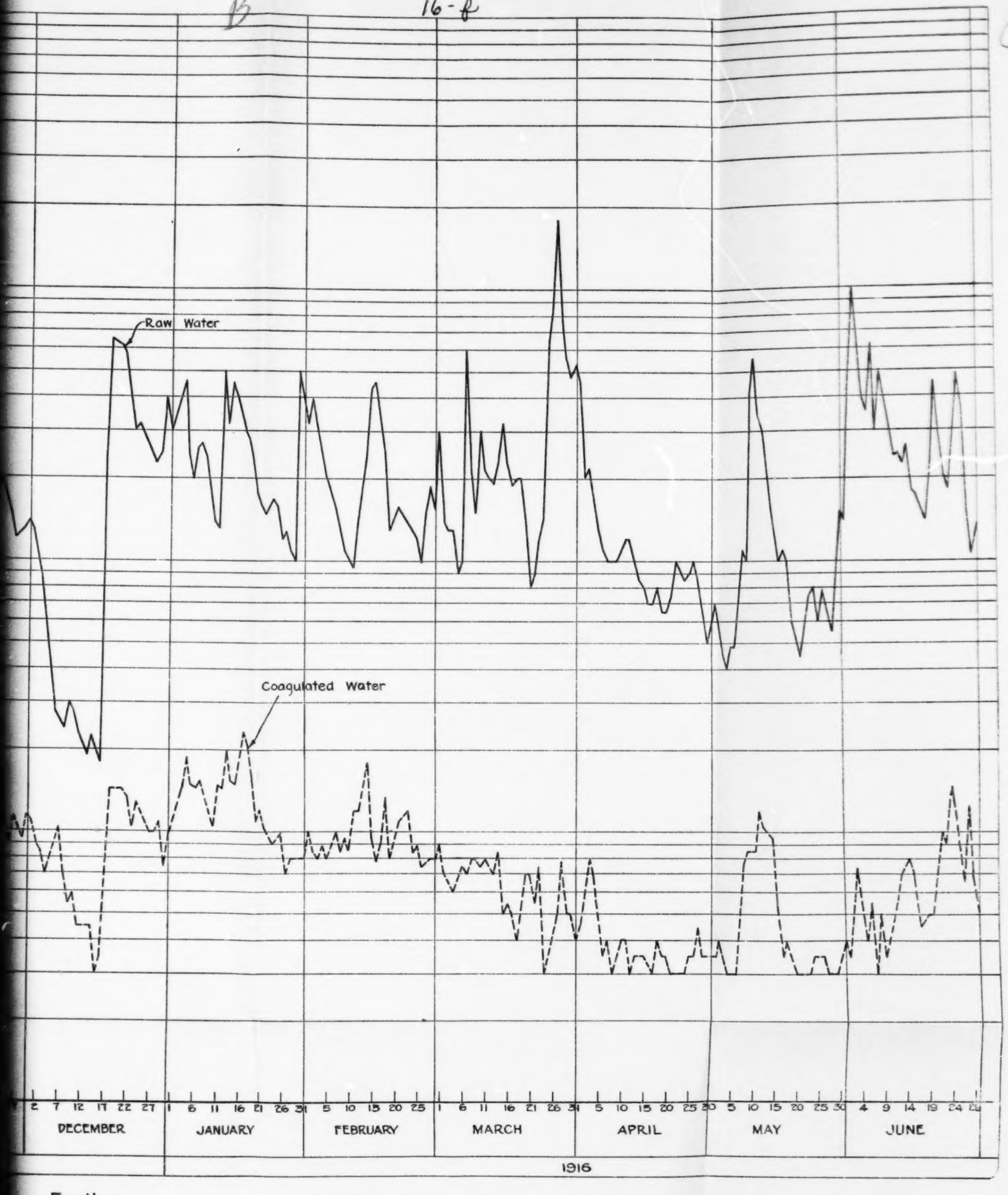

FIG. 11.

IDITY OF RAW AND COAGULATED WATERS
ATION PLANT DURING PERIOD OF
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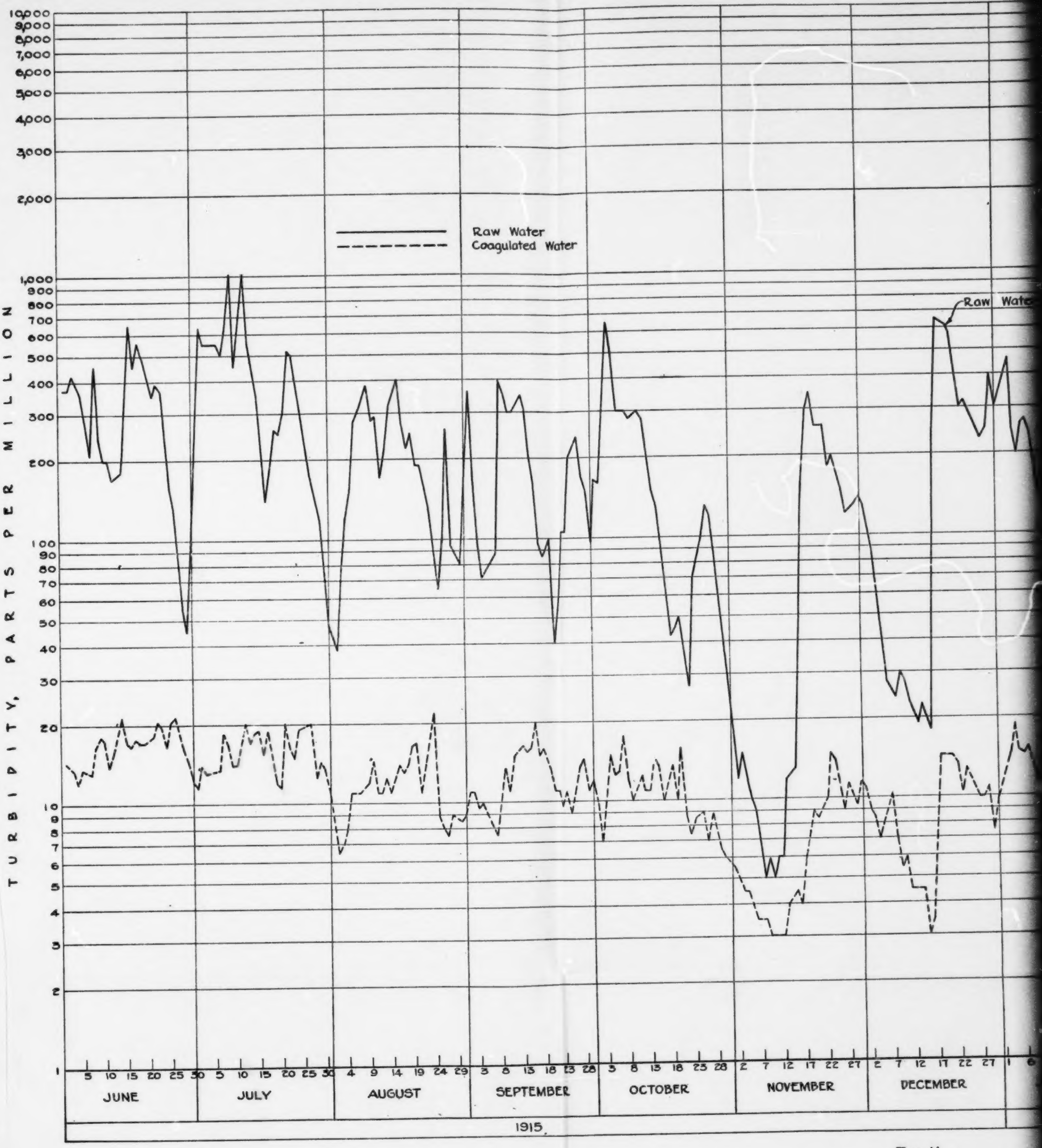

FIG. 11

DAILY VARIATION IN TURBIDITY OF RAW
AT CINCINNATI FILTRATION PLANT
JUNE, 1915 TO JUNE, 1916,

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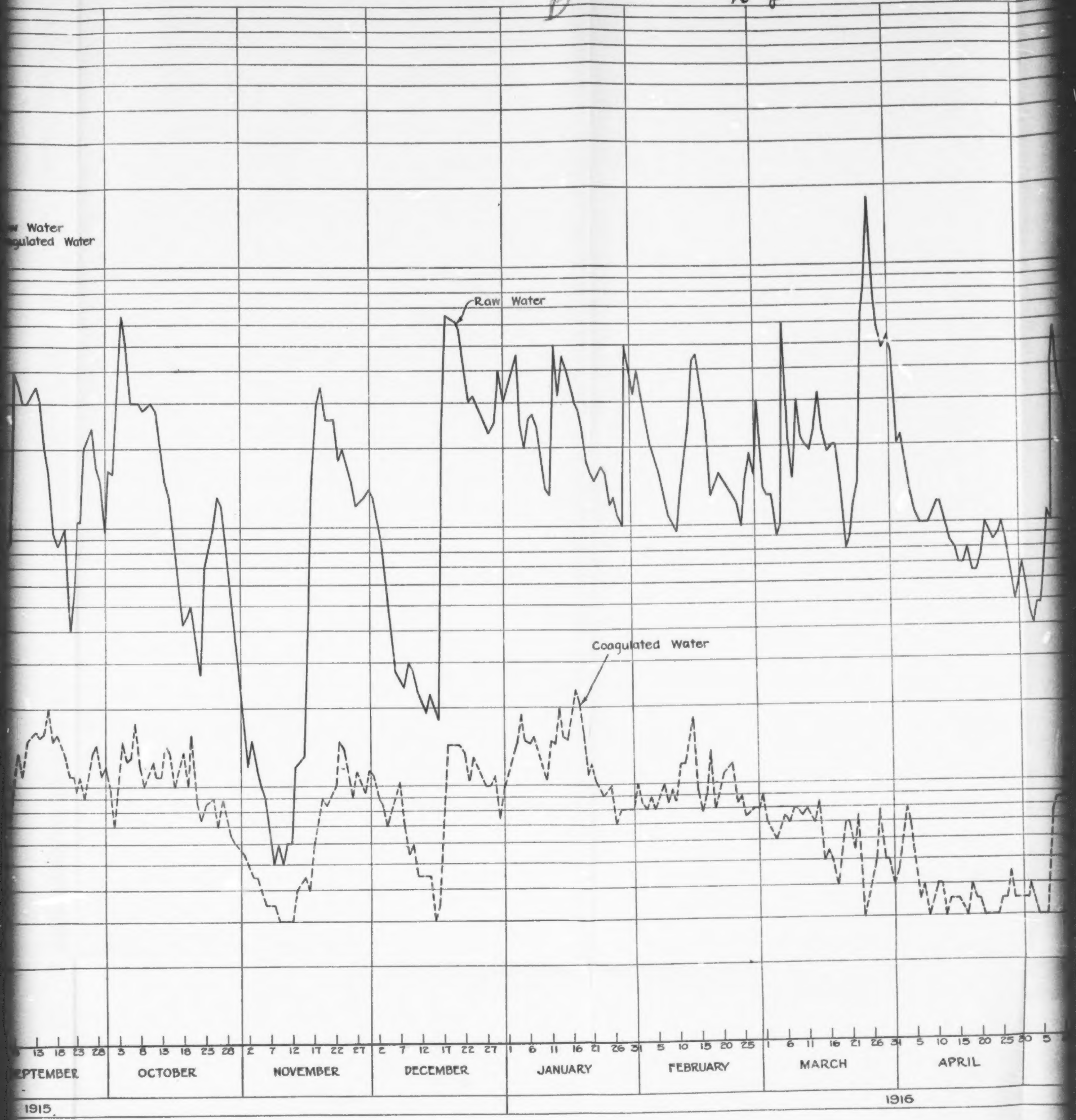

FIG. 11.

DAILY VARIATION IN TURBIDITY OF RAW AND COAGULATED WATERS AT CINCINNATI FILTRATION PLANT DURING PERIOD OF JUNE, 1915 TO JUNE, 1916, INCLUSIVE

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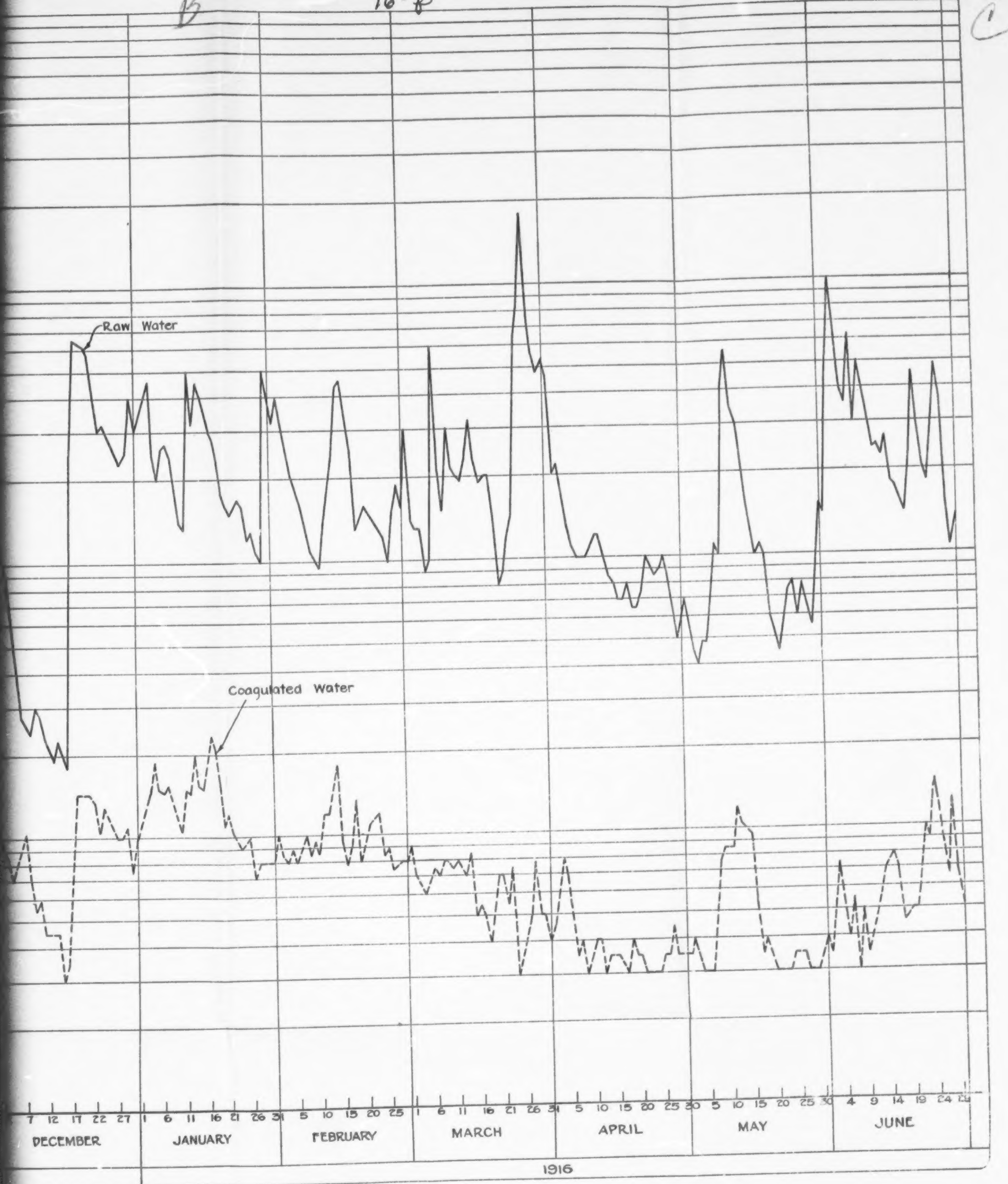

FIG. 11.

ITY OF RAW AND COAGULATED WATERS
TION PLANT DURING PERIOD OF
JUNE, 1916, INCLUSIVE

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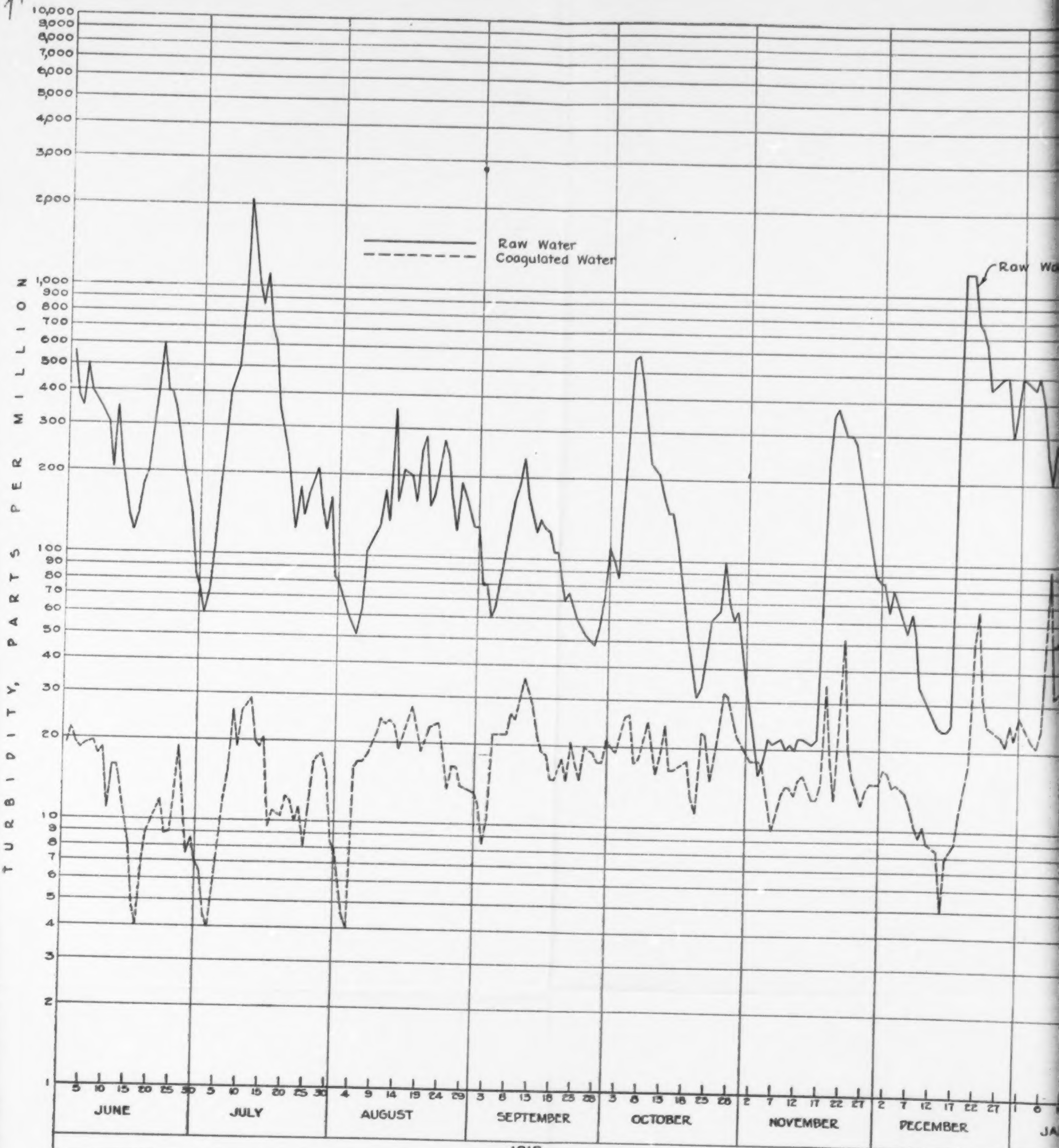

FIG. 12.

DAILY VARIATION IN TURBIDITY OF RAW

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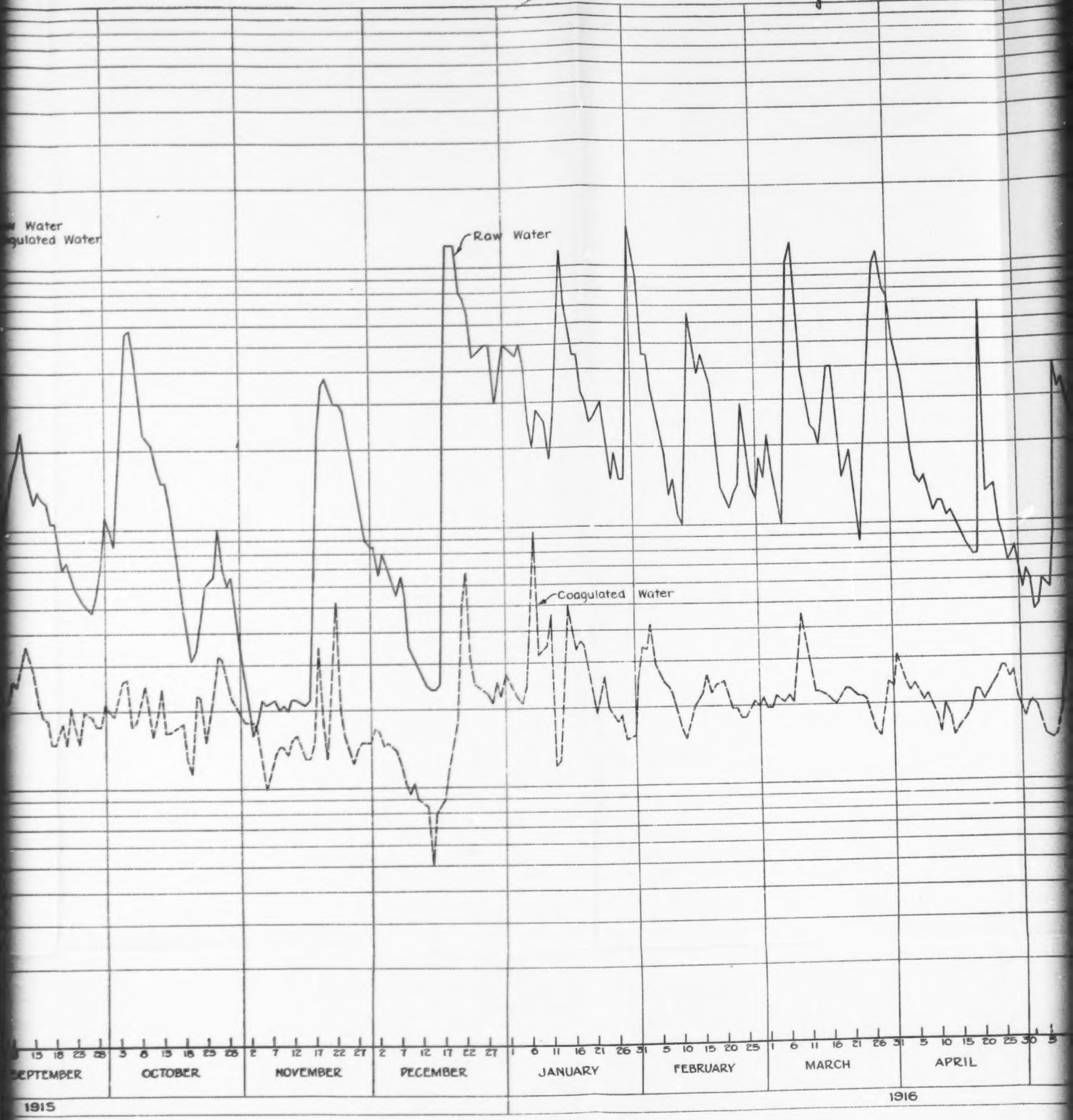

Fig. 12.

DAILY VARIATION IN TURBIDITY OF RAW AND COAGULATED WATERS AT LOUISVILLE FILTRATION PLANT DURING PERIOD OF JUNE, 1915 TO JUNE, 1916, INCLUSIVE

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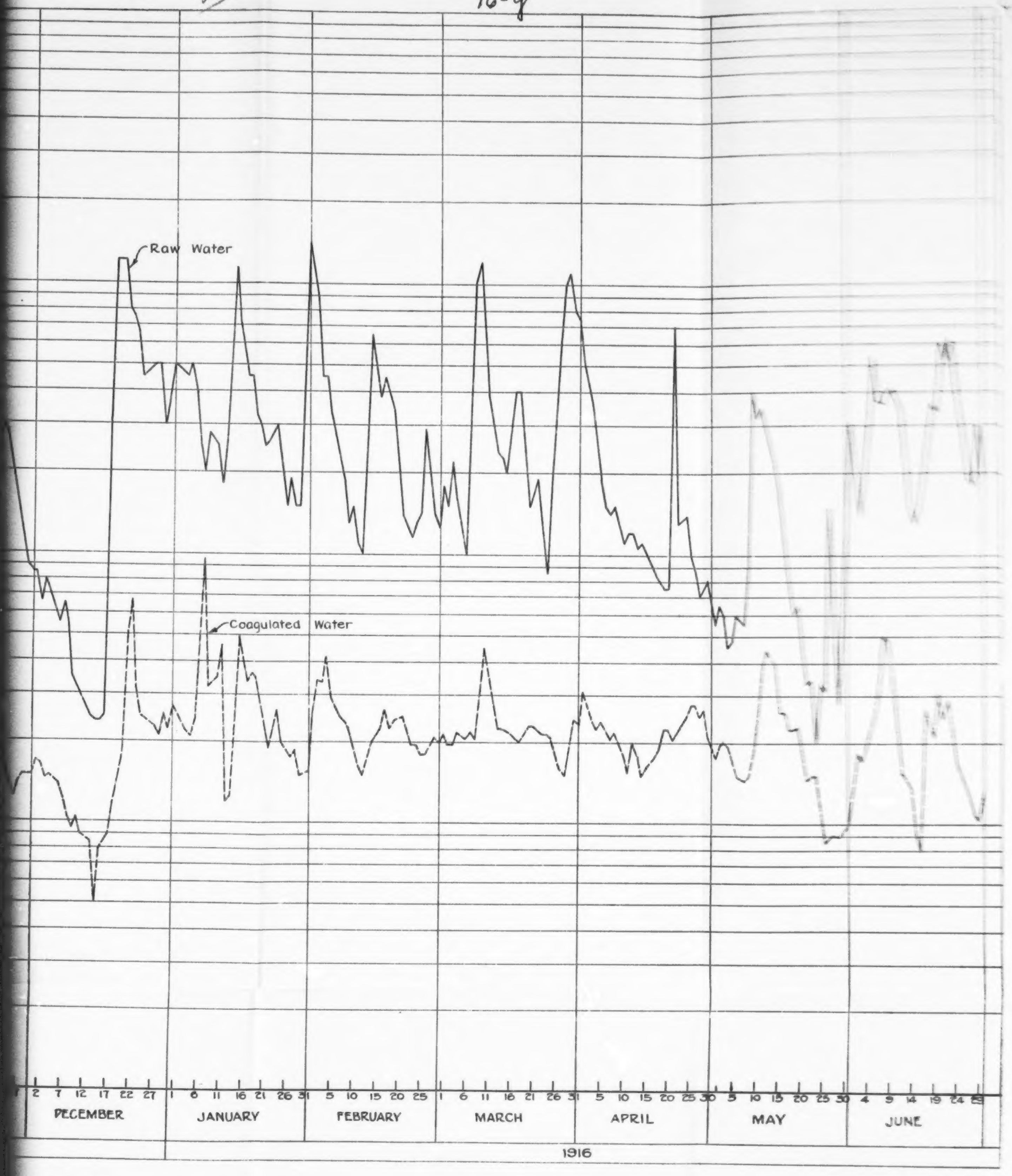

FIG. 12.

IDITY OF RAW AND COAGULATED WATERS
ATION PLANT DURING PERIOD OF
JUNE, 1916, INCLUSIVE

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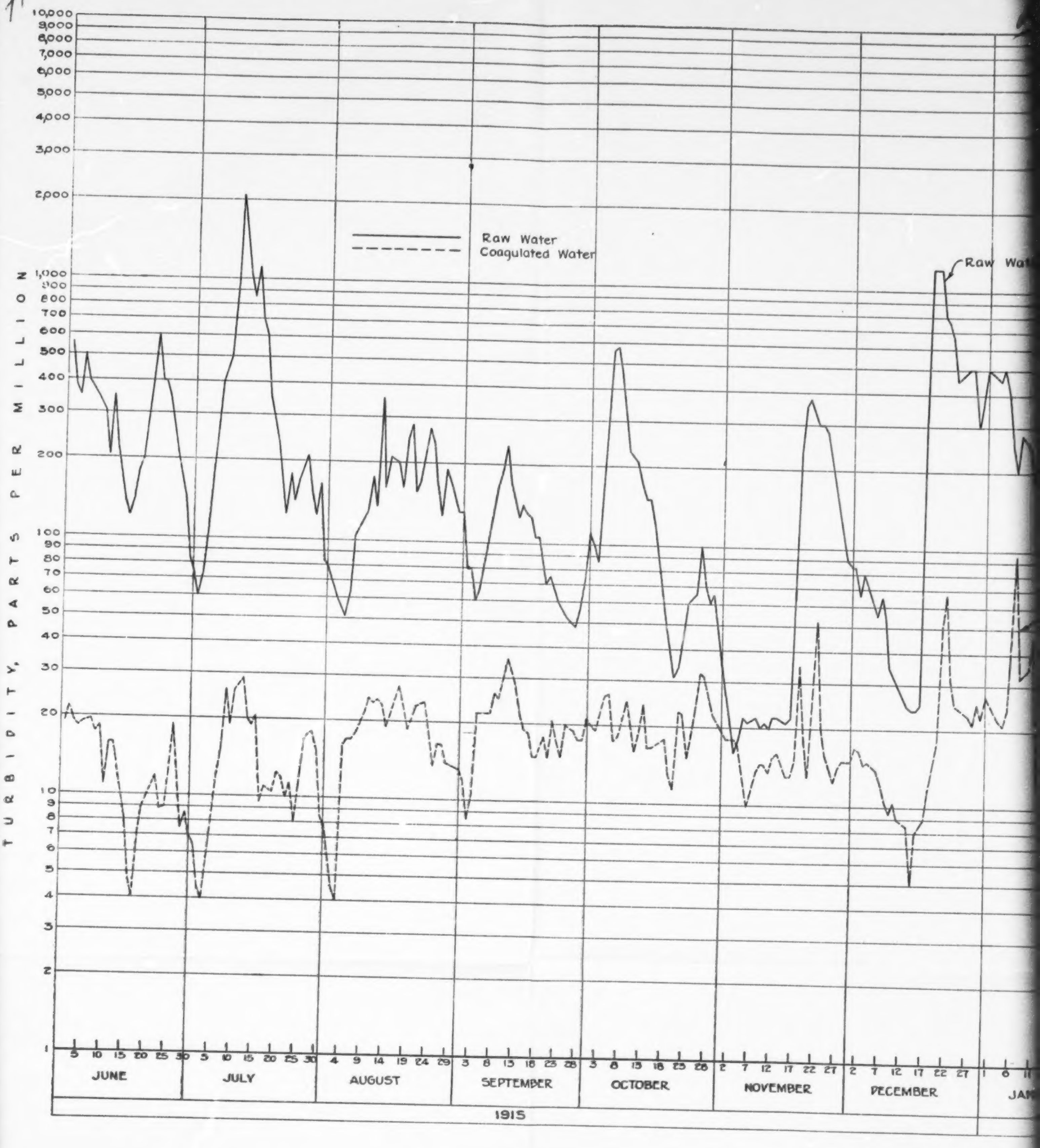

FIG. 12.

DAILY VARIATION IN TURBIDITY OF RAW A
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JUNE, 1915 TO JUNE, 1916, IN

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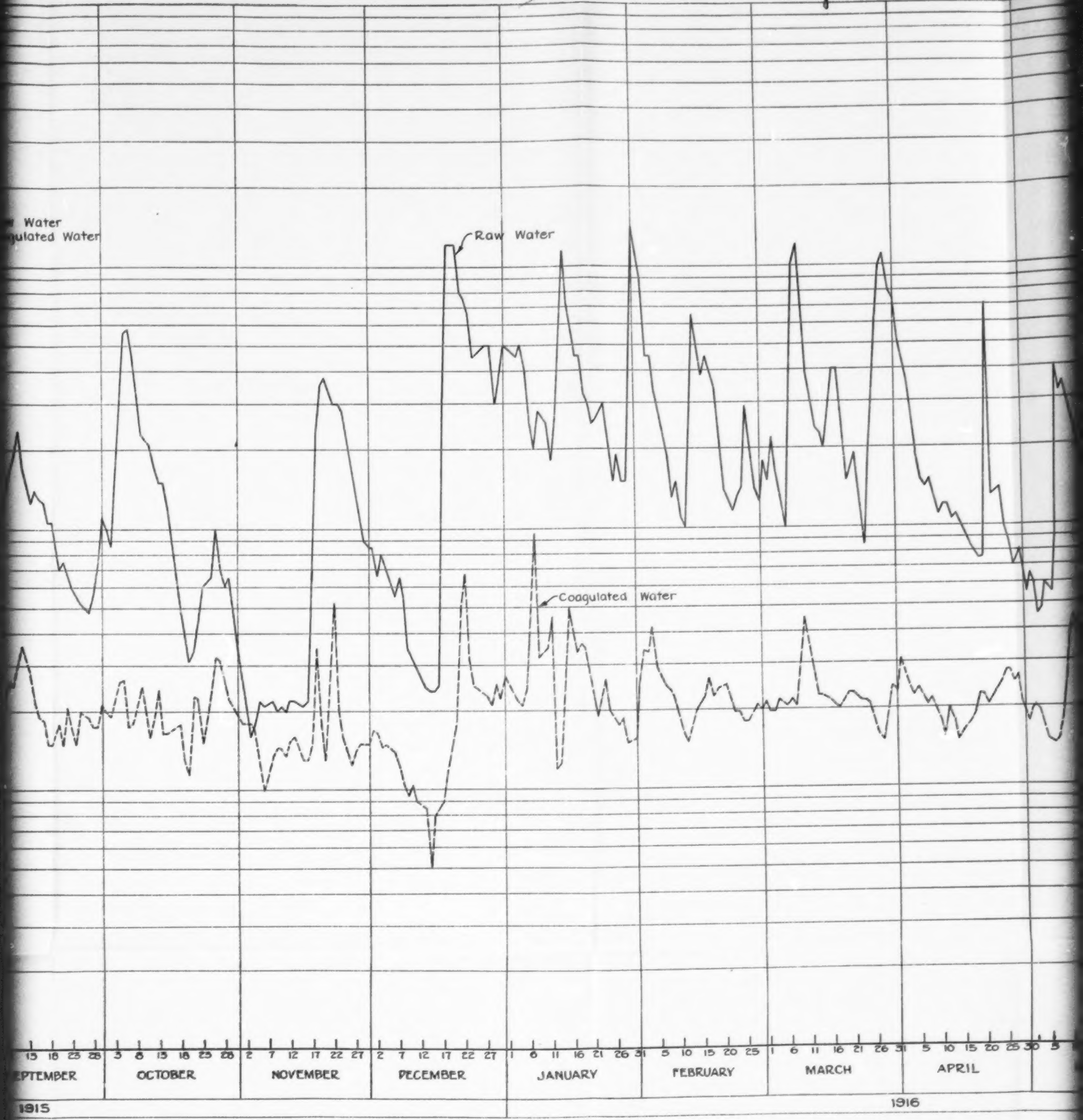

FIG. 12.

DAILY VARIATION IN TURBIDITY OF RAW AND COAGULATED WATERS
AT LOUISVILLE FILTRATION PLANT DURING PERIOD OF
JUNE, 1915 TO JUNE, 1916, INCLUSIVE

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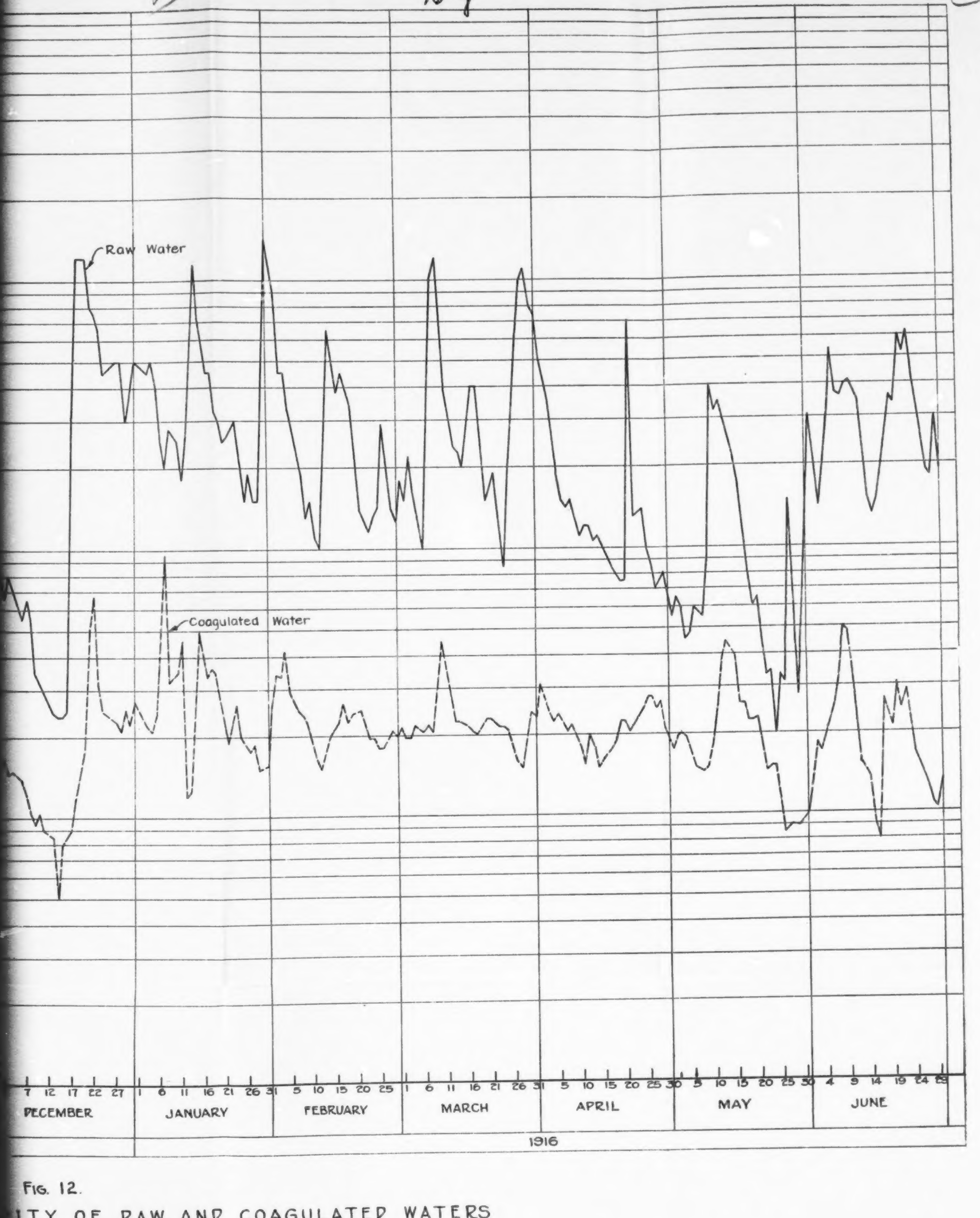

FIG. 12.

ITY OF RAW AND COAGULATED WATERS
TION PLANT DURING PERIOD OF
JUNE, 1916, INCLUSIVE

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44596—27. (Face p. 16.) No. 7

A

content of the raw waters at the two plants and that of the respective effluents corresponding with them, a series of separate calculations of this coefficient was made, basing them on the weekly average bacterial counts, at 20° C. and 37° C., and the *B. coli* indices, observed in the two raw waters and in the effluents from successive stages of purification. (See Tables Nos. 1 to 4.) As there were three separate determinations (i. e., the 20° count, the 37° count, and the *B. coli* index) and four possible combinations of the raw water with the various effluents at each plant, 12 calculations for each plant, or 24 in all, were made. (See Table No. 10 for results.) Of these 24 results, 15 showed the existence of correlation according to the criteria stated by King,[3] whereas in 9 cases little or no correlation was indicated.

TABLE NO. 10.—*Summary of coefficients of correlation obtained from correlations of weekly average bacterial counts in raw water with corresponding counts in effluents from successive stages of treatment*

Bacterial counts correlated [1]	Cincinnati filtration plant			Louisville filtration plant		
	Correlation coefficient (r)	Probable error (P. E.)	r/P. E.	Correlation coefficient (r)	Probable error (P. E.)	r/P. E.
48-hour gelatin count, 20° C.:						
A:B	0.889	0.018	49.38	0.812	0.030	27.06
A:C	.803	.031	25.90	.515	.064	8.04
A:D	.781	.034	22.97	.553	.061	9.06
A:E	.489	.067	7.29	−.141	.088	−1.60
24-hour agar count, 37° C.:						
A:B	.392	.074	5.24	.750	.038	19.73
A:C	.250	.124	2.01	.470	.068	6.91
A:D	.223	.084	2.63	.419	.076	5.44
A:E	.057	.088	.641	.197	.135	1.44
B. coli index:						
A:B	.459	.070	6.55	.242	.083	2.91
A:C	.303	.081	3.74	.097	.088	1.10
A:D	.326	.079	4.12	.111	.090	1.23
A:E	.309	.080	3.86	.073	.091	.802

[1] Key to notation:
A=raw water.
B=settled water.
C=coagulated water.
D=filter effluent (Cincinnati); applied water (Louisville).
E=final effluent.

Bearing in mind, however, that the Pearson-Galton coefficient is a direct measure only of straight-line correlation and ascertaining from a further study of the data that the relationships being investigated were in no case of the straight-line type, the results of these calculations were not regarded as being highly significant except as a means of comparing the degrees of correlation existing between the bacterial count of the raw water and that of the various effluents at successive stages of treatment. Thus it was found (Table No. 10) that the further removed a given effluent is from the initial stage of treatment, the less closely does its bacterial content tend to be correlated with that of the raw water, which is fully consistent with what would be expected, in view of the natural tendency of such correlations to be less well defined with each successive stage of purification interposed between a given effluent and the raw water.

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[3] The Elements of Statistical Method, W. I. King, 2d ed., p. 215. The MacMillan Co., New York City.

For the purpose of determining the nature of the relations existing between the bacterial content of the raw water and that of the various effluents, the most direct and simple graphical procedure would be that of plotting the results of individual observations, or weekly averages of these, against each other on coordinate paper, with the raw-water counts as abscissæ and the corresponding effluent counts as ordinates. Any relationship existing between the two variables would be shown by a distinct trend of the plotted points, to which a representative curve could be fitted by appropriate methods. In the present case, however, the plotting of individual observations in this manner was found to be impracticable, owing to the difficulties involved in fitting a proper curve to the large number of points obtained from plots of this character.[9] Since the result finally desired, moreover, was a curve expressing average experience in these relationships, it was not regarded as essential that it be shaped, necessarily, by either individual or short-term observations. In view of these circumstances, resort was had to the so-called method of "grouping," which is widely employed by statisticians for similar purposes.

The method of "grouping" is essentially a modification of the common statistical procedure involving the use of "quartile" and "sextile" averages, which consists (*a*) in forming a set of observations of two variables (usually termed as the "subject" and "relative," respectively) into a series arranged in the order of magnitude of the "subject" variable; (*b*) in dividing the resulting series into four, six, or any other convenient number of groups of equal size (termed "quartiles," "sextiles," etc.); and (*c*) in averaging separately all of the values of the "subject" and of the "relative" falling within each group. The average values of the "subject" and "relative" thus obtained may then be plotted against each other, the plotted points forming a well-defined curve if the two variables are related to each other.

The method of "grouping," which is the more convenient one when the number of observations is large, differs from the "quartile" or "sextile" method only in respect to the procedure followed in classifying the material, which in this case consists in dividing it into a series of groups, the limits of which are defined by ascending or descending ranges in values of the "subject" variable. For example, one group might be formed by gathering together all corresponding values of the "subject" and the "relative," of which values of the "subject" fell within a range from zero to 100; a second group for values ranging from 101 to 200; a third group for values ranging from 201 to 400, and so forth. After being thus grouped, the values of the "subject" and of the "relative" in each group are averaged separately and the resulting averages plotted against each other.

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[9] A further source of difficulty in this connection was the "lag" influence on the correlation, due to the time required for the effects of changes in the character of the raw water to be communicated to the various successive stages of purification. In the case of primary sedimentation, this time may be as high as two days at both plants, and in that of secondary sedimentation (coagulation) it usually is several hours. The effects of this "lag" are readily discernible in the plots of daily results in figs. 7 to 12 and, though not as evident in the corresponding plots of weekly averages, were found, nevertheless, to be a disturbing factor in the latter case.

If the limiting ranges of the "subject" defining the various groups are so selected that an approximately equal number of observations fall into each group, the results secured by the "grouping" method above described will be practically identical with those obtained by the method of "quartiles" or "sextiles," assuming the same number of groups to have been formed in each case. This procedure of equalizing the distribution of the observations among the several groups has the advantage of affording a series of group averages, each one of which is based on approximately the same number of observations and is subject, therefore, to about the same margin of error, assuming, of course, that the errors of the various individual observations are, roughly, of the same degree.

Following the procedure above described, the weekly average data given in Tables Nos. 1 to 4 were grouped, for each plant separately, according to the numbers of bacteria and of *B. coli* observed in the raw water, with results as shown in Table No. 11. On referring to this table it is noted that, with a few inconsistencies,[10] a decided tendency is shown for an increase in the bacterial content of the various effluents corresponding to an increase in that of the raw water. A typical plot of the figures thus obtained, using linear coordinate scales (see fig. 13), indicates that, in general, the increase in the effluent count is not in proportion to that of the raw water count, which indication is borne out by the tendency of the percentages of raw water count remaining in the effluents to become diminished with an increase in this count. In other words, the efficiency of bacterial removal tends to increase with the numbers of bacteria present in the raw water.

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[10] These inconsistencies appear to be due largely to the effects of disturbances in the normal performance of each plant, notably to that of secondary growths of bacteria occurring in the various basins. In a few cases, where these effects were both gross and obvious, the result was excluded from the group average. In a majority of cases, particularly where the disturbed condition was relatively long continued, the results thereby affected were included in the group averages.

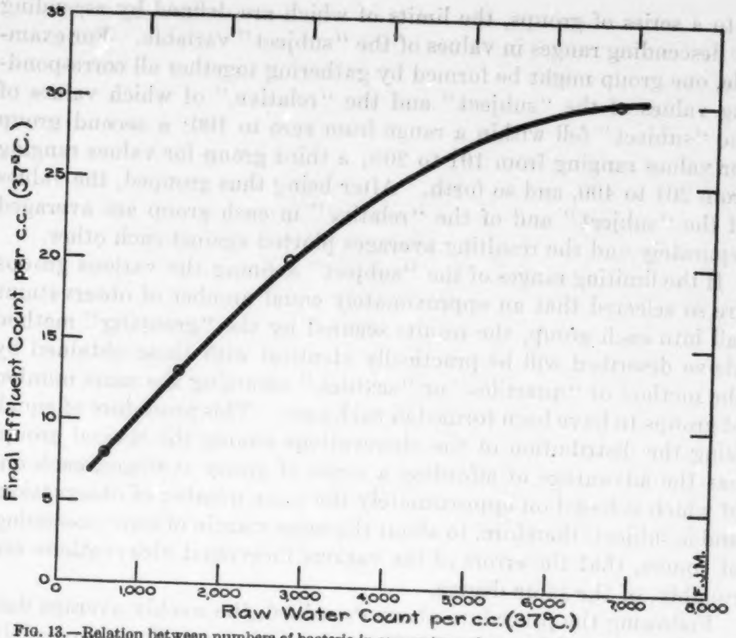

FIG. 13.—Relation between numbers of bacteria in raw water and corresponding numbers in final effluent, as based on combined data for the Cincinnati and Louisville plants. (Plot of data given in Table No. 14—24-hour agar counts, 37° C.)

TABLE No. 11.—*Relations between numbers of bacteria in raw water and corresponding numbers in effluents from successive stages of treatment*

[Derived from groupings of weekly average data according to raw-water counts]

A. CINCINNATI FILTRATION PLANT

Raw-water count range	Average count					Per cent of raw-water count remaining in—			
	Raw	Settled	Coagulated	Filtered [1]	Final	Settled	Coagulated	Filtered	Final
48-hour gelatin count, 20° C. (per cubic centimeter):									
0-2,500	1,440	447	170	19	[2] 41.0	31.0	11.8	1.3	2.8
2,501-5,000	3,310	900	238	25	40.0	27.2	7.2	.76	1.2
5,001-10,000	7,350	1,390	458	54	59.0	18.9	6.2	.73	.80
Over 10,000	24,800	7,020	1,300	293	79.0	28.3	5.2	1.2	.32
24-hour agar count, 37° C. (per cubic centimeter):									
0-1,000	525	250	70	6	8.0	47.6	13.3	1.1	1.5
1,001-2,000	1,420	469	116	9	16.0	33.0	8.2	.63	1.1
2,001-4,000	2,810	930	234	30	25.0	33.1	8.3	1.1	.89
Over 4,000	7,350	1,300	218	33	36.0	17.7	3.0	.45	.49
***B. coli* index (per 100 c. c.):**									
0-1,000	685	362	146	10	2.2	52.9	21.3	1.5	.32
1,001-5,000	3,150	759	287	34	9.9	24.1	9.1	1.1	.31
5,001-20,000	9,190	1,170	561	73	23.0	12.7	6.1	.79	.25
Over 20,000	26,400	1,690	588	113	47.0	6.4	2.2	.43	.18

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[1] In section B of the table the figures given in this column refer to the coagulated water immediately after chlorination and prior to filtration.

[2] Influenced by effects of aftergrowths in the clear-water reservoir. Omitting results thus affected, the average count for this group would be 19 per cubic centimeter.

TABLE NO. 11.—*Relations between numbers of bacteria in raw water and corresponding numbers in effluents from successive stages of treatment*—Continued

B. LOUISVILLE FILTRATION PLANT

Raw-water count range	Average count					Per cent of raw-water count remaining in—			
	Raw	Settled	Coagulated	Filtered	Final	Settled	Coagulated	Filtered	Final
48-hour gelatin count, 20° C. (per cubic centimeter):									
0-2,500	1,400	655	159	31	20.0	46.8	11.4	2.2	1.4
2,501-5,000	4,050	1,310	323	45	32.0	32.3	8.0	1.1	.79
5,001-10,000	7,310	1,680	344	42	44.0	23.0	4.7	.57	.60
Over 10,000	27,900	9,780	1,720	111	51.0	35.0	6.2	.40	.18
24-hour agar count, 37° C. (per cubic centimeter):									
0-1,000	623	339	134	38	6.0	54.3	21.5	6.1	.96
1,001-2,000	1,500	689	242	33	10.0	45.9	16.1	2.2	.67
2,001-4,000	2,770	1,240	240	40	[3] 14.0	44.8	8.7	1.4	.51
Over 4,000	6,080	2,030	523	48	[3] 23.0	33.4	8.6	.79	.38
B. coli index (per 100 c. c.):									
0-1,000	905	[4] 592	244	18	[5] 2.3	65.4	27.0	2.0	.25
1,001-5,000	3,350	1,540	312	14	3.1	46.0	9.3	.42	.093
5,001-20,000	7,620	2,500	396	14	4.5	32.8	5.2	.18	.059
Over 20,000	30,900	2,490	417	32	6.0	8.1	1.3	.10	.019

[3] Results for 3 weeks greatly in excess of the normal, apparently owing to the effects of aftergrowths; excluded from the group averages.

[4] Abnormally high results for 2 weeks due to disturbances incidental to cleaning the primary settling basins; excluded from the group average.

[5] The 5 corrected figures given in Table No. 4 used instead of the uncorrected figures.

The average bacterial counts observed at the two plants, in the effluents from the same stages of purification and corresponding with raw-water counts falling within equivalent ranges, are shown, in Table No. 11, to agree with each other very closely, considering the various factors which naturally would cause a certain degree of divergence in them. In order to compare these figures more conveniently, Table No. 12 has been prepared, giving in parallel columns the corresponding average numbers of bacteria and of *B. coli* observed in the two raw waters and in the effluents common to both plants, together with the mean of each pair of results. The only marked divergence in the bacterial content of the three corresponding effluents appears to be in that of the final effluent, which is shown to be measurably lower for the Louisville plant throughout the entire range of raw-water counts, this being particularly true as regards the *B. coli* content.

Table No. 12.—*Comparison and combination of group average figures for the Cincinnati and Louisville plants for stages of purification common to both plants*

[Based on data in Table No. 11]

Raw-water count range	Average numbers											
	Raw			Settled			Coagulated			Final effluent		
	Cincinnati	Louisville	Combined [1]	Cincinnati	Louisville	Combined [1]	Cincinnati	Louisville	Combined [1]	Cincinnati	Louisville	Combined [1]
Gelatin, 48 hours, 20° C. (per cubic centimeter):												
0-2,500	1,440	1,400	1,420	447	655	551	170	159	165	[2]41.0	20.0	30.0
2,501-5,000	3,310	4,050	3,680	900	1,310	1,100	238	323	280	40.0	32.0	36.0
5,001-10,000	7,350	7,310	7,330	1,386	1,680	1,520	458	344	406	59.0	44.0	52.0
Over 10,000	24,800	27,900	26,400	7,020	9,780	8,450	1,300	1,720	1,520	79.0	51.0	65.0
Agar, 24 hours, 37° C. (per cubic centimeter):												
0-1,000	525	623	574	250	339	271	70	134	85	8.0	6.0	8.0
1,001-2,000	1,420	1,500	1,460	469	689	567	116	242	173	16.0	10.0	13.3
2,001-4,000	2,810	2,770	2,790	930	1,240	1,110	234	240	238	25.0	14.0	20.0
Over 4,000	7,350	6,080	6,800	1,300	2,030	1,800	218	523	430	36.0	23.0	30.0
B. coli index (per 100 c. c.):												
0-1,000	685	905	754	362	592	422	146	244	179	2.2	2.3	2.0
1,001-5,000	3,150	3,350	3,240	759	1,540	1,110	287	312	299	9.9	3.1	6.5
5,001-20,000	9,190	7,620	8,050	1,170	2,500	2,160	561	396	440	23.0	4.5	9.1
Over 20,000	26,400	30,900	28,600	1,690	2,490	2,090	588	417	503	47.0	6.0	27.0

[1] Figures designated as "combined" are weighted averages of the corresponding figures for the two plants, the weights in each case being the total number of items comprising each separate group average.

[2] See footnote (²), Table No. 11.

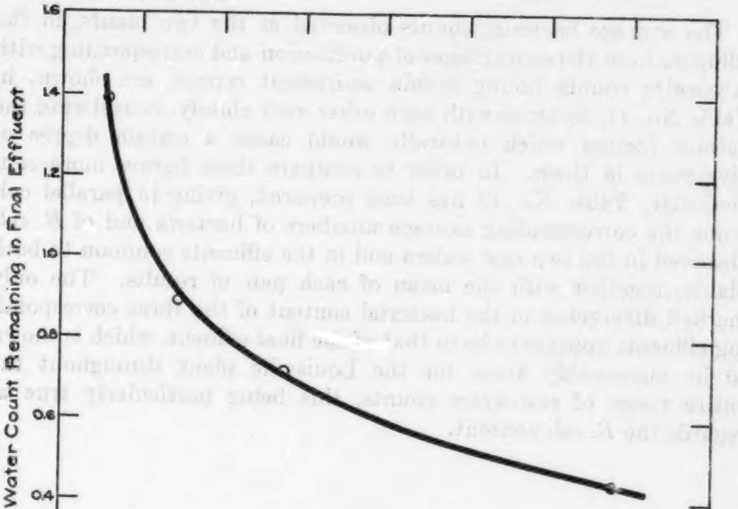

Fig. 14.—Relation between numbers of bacteria in raw water and percentages of these numbers remaining in the final effluent, as shown by curve in Figure 13

In Table No. 13 are given the percentages of residual bacteria and *B. coli* corresponding to the mean figures for the two plants given in Table No. 12. The tendency of these percentages to become progressively diminished with increasing numbers of bacteria in the raw water is clearly shown. In the plot of a portion of these data shown in Figure 14, it is noted, however, that a tendency exists for the residual percentages to become asymptotic to a more or less well-defined minimum value in each case, indicating that the over-all efficiency of bacterial purification tends to reach a certain maximum, with increasing raw-water pollution, beyond which no further marked increase in efficiency may be expected.

Table No. 13.—*Percentages of residual bacteria corresponding to various ranges of numbers observed in raw water*

[Based on combined averages of groupings as summarized in Table No. 12]

Raw-water count range	Average raw-water count	Per cent of raw-water count remaining in—		
		Settled	Coagulated	Final
Gelatin count, 48 hours, 20° C. (per cubic centimeter):				
0-2,500	1,420	38.8	11.6	2.12
2,501-5,000	2,180	50.5	12.8	1.65
5,001-10,000	7,330	20.7	5.5	.71
Over 10,000	26,400	32.0	5.8	.26
Agar count, 24 hours, 37° C. (per cubic centimeter):				
0-1,000	574	47.2	14.8	1.39
1,001-2,000	1,460	38.8	11.8	.89
2,001-4,000	2,790	39.8	8.5	.72
Over 4,000	6,800	26.5	6.3	.44
B. coli index (per 100 c. c.):				
0-1,000	754	55.9	23.8	.30
1,001-5,000	3,240	34.3	9.3	.20
5,001-20,000	8,050	26.8	5.5	.11
Over 20,000	28,600	7.3	1.8	.09

Relations Between Bacterial Quality of Influents to and Effluents from Separate Stages of Purification.

From the fact that the foregoing correlations were found to exist between the bacterial quality of the raw-water supply at each one of the two plants and that of their respective final effluents after passing through the several stages of treatment, it would naturally be inferred that a similar series of correlations should exist between the quality of the influent and effluent waters at each separate stage. By successively grouping and averaging the data according to the bacterial counts observed in the influent water flowing to each stage and computing the corresponding average effluent counts for each group (employing the same method as previously described), a well-marked relation was found to exist at each stage of treatment. In Table No. 14 are tabulated the results of these groupings as obtained from the *B. coli* index figures given in Table No. 4. In every case the *B. coli* index as observed in the effluent is shown to increase with that of the influent to a particular stage.

Table No. 14.—*Relations between numbers of B. coli observed in the influent waters to each separate stage of purification and corresponding numbers in the effluents therefrom*

[Obtained by separate groupings of weekly average data according to numbers of *B. coli*[1] in each respective influent water]

A. CINCINNATI FILTRATION PLANT

Primary plain sedimentation				Coagulation			
Raw-water B. coli range	Average B. coli index		Per cent of raw in settled	Settled-water B. coli range	Average B. coli index		Per cent of settled in coagulated
	Raw	Settled			Settled	Coagulated	
0-1,000	685	362	52.8	0-250	127	84	66.2
1,001-5,000	3,150	759	24.1	251-500	364	183	50.3
5,001-20,000	9,190	1,170	12.8	501-1,000	692	256	37.0
Over 20,000	26,400	1,690	6.3	Over 1,000	1,720	524	30.5

Filtration				Chlorination of filter effluent			
Coagulated-water B. coli range	Average B. coli index		Per cent of coagulate in filtered	Filtered-water B. coli range	Average B. coli index		Per cent of filtered in final
	Coagulated	Filtered			Filtered	Final	
0-100	55	10	18.2	0-25	10	2.5	25.0
101-200	148	26	17.6	26-50	35	9.0	25.7
201-400	286	43	15.1	51-100	86	20.0	23.3
Over 400	845	140	16.6	Over 100	182	44.0	24.2

B. LOUISVILLE FILTRATION PLANT

Primary plain sedimentation				Coagulation			
Raw-water B. coli range	Average B. coli index		Per cent of raw in settled	Settled-water B. coli range	Average B. coli index		Per cent of settled in coagulated
	Raw	Settled			Settled	Coagulated	
0-1,000	[2] 845	[2] 592	70.1	0-500	293	116	39.6
1,001-5,000	3,350	1,540	46.0	501-1,000	661	228	34.5
5,001-20,000	7,620	2,500	32.9	1,001-2,000	1,620	369	22.8
Over 20,000	30,900	2,490	8.1	Over 2,000	3,680	633	17.2

Chlorination of coagulated water				Filtration			
Coagulated-water B. coli range	Average B. coli index		Per cent of coagulate in applied	Applied-water B. coli range	Average B. coli index		Per cent of applied in final
	Coagulated	Applied			Applied	Final	
0-100	62	9	14.5	0-10	3.1	0.9	29.0
101-250	186	13	7.0	11-20	14.1	2.9	20.6
251-500	356	16	4.5	21-40	29.7	3.9	13.1
Over 500	1,300	30	2.3	Over 40	103.0	6.0	5.8

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[1] Numbers of *B. coli* expressed in terms of the *B. coli* index per 100 c. c.

[2] Results for 2 weeks abnormal owing to disturbances resulting from cleaning of primary sedimentation basins; excluded from both averages.

In Table No. 14 are also given the percentages of the influent water count remaining in the effluent, corresponding to each pair of influent and effluent figures. On referring to the percentages for the Cincinnati plant it is noted that at the first two stages comprising the preliminary treatment, namely, primary sedimentation and coagulation, the proportion of residual *B. coli* is progressively diminished with increasing numbers of *B. coli* in the influent water, whereas, at the last two stages, filtration and chlorination, it remains practically constant throughout the entire range of influent counts. The corresponding figures for the Louisville plant, however, show progressively decreasing percentages of residual *B. coli* at each one of the four stages. The marked divergence thus indicated in the behavior of filtration and chlorination efficiencies at the two plants is difficult to explain, though conditions surrounding the operation of these particular stages of treatment were decidedly different at the Louisville plant than at the Cincinnati plant during the period of these observations, owing to the fact that in the former case the water was chlorinated before, and in the latter case after, filtration. At both plants, however, the tendency toward a progressively diminishing, as distinguished from a constant, percentage of residual *B. coli* with higher numbers of *B. coli* in the influent water, was displayed to a more marked extent in the preliminary stages of treatment involving sedimentation, both with and without the aid of coagulation, than in the later stages comprising filtration and chlorination. As would be expected, this orderly increase in the efficiency of *B. coli* removal by various separate stages of the purification process, coinciding with increasing numbers of *B. coli* in the influent water, is shown in Table No. 14 to have produced a similar effect on the over-all efficiency of purification as referred to the raw water.

Influence of Turbidity and Seasonal Variations on Efficiency of Bacterial Removal.

It has become a well-established observation among filter-plant operators that the efficiency with which a water can be clarified by rapid sand-filtration processes is influenced very considerably by the amount of turbidity present in the raw water. Experience with the purification of waters of widely differing degrees of average clarity, such as, for example, the relatively clear waters of the Great Lakes as contrasted with the highly turbid river waters of the Mississippi Basin, has shown that the more heavily silted waters can be purified bacterially with greater facility and efficiency than can those of the clearer type. In connection with the present study, the question was presented as to whether variations in the turbidity of Ohio River water might be expected to influence the efficiency of its bacterial purification to such an extent that any marked change in the ratio existing between the average turbidity of the river and its mean bacterial content at a given point would disturb to a measurable extent the bacterial correlations which have been shown in the foregoing tables. In the case of rivers such as the Ohio, where the ratio between the average bacterial content and the mean turbidity may be expected to increase with their pollution (the average turbidity over long periods presumably remaining nearly constant), this question has a bearing on the validity of the foregoing correlations as a basis for estimating the probable future conditions of bacterial pollution of raw water supplies taken from polluted streams under which purification plants might be expected to fail to produce effluents of a specified bacterial quality.

In order to test this question, two different analyses of the laboratory data were made, employing in each instance a fairly representative section of the data for the purpose. In the first case the groupings of weekly average *B. coli,* summarized by individual stages of treatment in Table No. 14, were tabulated in parallel with groupings of the corresponding turbidities observed coincidentally in the influents and effluents of the first two stages of treatment, namely, primary sedimentation and coagulation.[11] From these figures the corresponding percentages of *B. coli* and of turbidity, respectively, remaining in the effluents from the two stages were computed and tabulated, the results being summarized in Table No. 15.

TABLE NO. 15.—*Relations between numbers of B. coli and amounts of turbidity removed by primary plain sedimentation and by secondary sedimentation aided by coagulation*

[Based on groupings of weekly average data according to numbers of *B. coli*]

A. CINCINNATI FILTRATION PLANT

PRIMARY PLAIN SEDIMENTATION

Raw-water B. coli index range (per 100 c. c.)	Average B. coli index per 100 c. c.		Average corresponding turbidity		Percentage of raw remaining in settled	
	Raw	Settled	Raw	Settled	B. coli	Turbidity
0-1,000	685	362	130	49	52.8	37.8
1,001-5,000	3,150	759	238	82	24.1	34.5
5,001-20,000	9,190	1,170	311	80	12.8	25.7
Over 20,000	26,400	1,690	361	105	6.3	29.1

SECONDARY SEDIMENTATION WITH COAGULATION

Settled-water B. coli index range (per 100 c. c.)	Average B. coli index per 100 c. c.		Average corresponding turbidity		Percentage of settled remaining in coagulated	
	Settled	Coagulated	Settled	Coagulated	B. coli	Turbidity
0-500	127	84	54	7.4	66.2	13.7
501-1,000	364	183	79	11.0	50.3	13.9
1,001-2,000	692	756	106	11.3	37.0	10.7
Over 2,000	1,720	524	101	11.9	30.5	11.8

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[11] It was not practicable to apply a similar test to the later stages of purification, owing to the absence of measurable turbidity in the water after filtration.

TABLE No. 15.—*Relations between numbers of B. coli and amounts of turbidity removed by primary plain sedimentation and by secondary sedimentation aided by coagulation*—Continued

B. LOUISVILLE FILTRATION PLANT

PRIMARY PLAIN SEDIMENTATION

Raw-water B. coli index range (per 100 c. c.)	Average B. coli index per 100 c. c.		Average corresponding turbidity.		Per cent of raw remaining in settled	
	Raw	Settled	Raw	Settled	B. coli	Turbidity
0-1,000	845	592	125	68	70.2	54.4
1,001-5,000	3,350	1,540	186	95	46.0	51.2
5,001-20,000	7,620	2,500	330	175	32.9	53.0
Over 20,000	30,900	2,490	440	185	8.1	42.1

SECONDARY SEDIMENTATION WITH COAGULATION

Settled water B. coli index range (per 100 c. c.)	Average B. coli index per 100 c. c.		Average corresponding turbidity		Per cent of settled remaining in coagulated	
	Settled	Coagulated	Settled	Coagulated	B. coli	Turbidity
0-500	293	116	31	13	39.6	42.0
501-1,000	661	228	92	18	34.5	19.6
1,001-2,000	1,620	369	124	25	22.8	20.2
Over 2,000	3,680	633	180	19	17.2	10.6

On referring to this table it is noted that with the exception of the second stage of treatment at the Louisville plant, the percentages of turbidity remaining in each effluent, though becoming slightly less with an increasing *B. coli* content in the influent water, were diminished far less proportionately than were the corresponding percentages of residual *B. coli*. In this connection it also will be noted that a measurable increase in the turbidity of the influent water is shown to accompany the increase in *B. coli* index represented by the group averages for the ascending ranges in *B. coli* content. Stated in another way, the figures indicate, with the single exception noted, that the efficiency of turbidity removal tends to remain very nearly constant under an increasing bacterial load, whereas that of bacterial removal becomes increased very decidedly. This result would appear to indicate that the bacterial efficiency of plain sedimentation and coagulation, though influenced slightly by variations in turbidity, is affected thereby to a far less extent than it is by variations in bacterial content.

A practically similar indication was furnished by the results of another test of the data, originally given in connection with a previous publication [12] and reproduced in Table No. 16. Reference to this table shows that, excepting in the bacterial count range,

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[12] Reprint No. 737 from Public Health Reports, Mar. 31, 1922, Table IV, p. 7.

1,000–2,500, the percentages of residual bacteria corresponding to a given range in raw-water bacteria remain virtually constant with variations in raw-water turbidity ranging from 50 to 1,000 parts per million. On the other hand, the figures indicate a progressive decrease in the bacterial residuals coinciding with an increase in the raw-water bacterial count. It thus appears that the influence of turbidity variation on the efficiency of bacterial purification, though present in a slight degree, is largely overshadowed by that of variations in the numbers of bacterial present in the influent water. The results obtained from the two foregoing tests would indicate, therefore, that the bacterial correlations previously described would hardly be expected to be affected to more than a minor extent by any future changes in the average proportions of turbidity and bacterial content in the Ohio River.

TABLE No. 16.[1]—*Relative effects of variations in raw-water turbidity and in bacterial content upon percentages of raw-water bacteria remaining in coagulated water*

Bacteria per cubic centimeter in raw water ranging—	Percentages of raw-water bacteria remaining in coagulated water with raw-water turbidities of—			
	50–100 p. p. m.	101–250 p. p. m.	251–500 p. p. m.	501–1,000 p. p. m.
1,000–2,500	14.4	8.3	----------	----------
2,501–5,000	8.4	8.9	7.2	----------
5,001–10,000	----------	----------	3.3	3.8

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[1] Reproduction of Table IV on p. 7 of article, "The loading of filter plants," Reprint No. 737 from Public Health Reports, Mar. 31, 1922.

In order to determine whether variations in seasonal conditions gave any indications of influencing the efficiency of bacterial purification, the following test was made. The daily bacterial counts (gelatin at 20° C.) observed in the raw water and in the unchlorinated and chlorinated filter effluents at the Cincinnati plant were divided into four seasonal groups, each of three months' duration, comprising June–August, September–November, December–February, and March–May, respectively. Each one of the four groups of data thus classified was then regrouped according to raw-water counts by the method previously described, and the group averages were tabulated, together with the corresponding percentages of residual bacteria, as shown in Table No. 17.

TABLE NO. 17.—*Average numbers of bacteria in the raw water and corresponding average numbers in the unchlorinated and chlorinated filter effluents at the Cincinnati filtration plant, with raw water numbers falling within given ranges and during four designated seasonal periods* [1]

Plant load group (bacteria per cubic centimeter)	Bacterial count per cubic centimeter, 48 hours, 20° C.			Per cent of raw-water count	
	Raw water	Filter effluent	Final effluent	Filter effluent	Final effluent
0-1,000:					
June-August	658	8	54	1.22	8.20
September-November	478	19	32	3.97	6.69
December-February	------	------	------	------	------
March-May	858	6	17	.70	1.98
1,000-2,500:					
June-August	1,730	21	48	1.22	2.78
September-November	1,555	23	29	1.48	1.87
December-February	2,200	108	44	4.91	2.00
March-May	1,550	20	46	1.29	2.96
2,500-5,000:					
June-August	3,320	22	44	.66	1.33
September-November	3,380	35	35	1.04	1.04
December-February	4,180	97	29	2.32	.69
March-May	3,030	38	37	1.25	1.22
5,000-10,000:					
June-August	8,610	23	50	.27	.58
September-November	7,070	47	32	.67	.45
December-February	6,610	77	38	1.17	.57
March-May	7,080	78	40	1.10	.56
10,000-20,000:					
June-August	15,220	43	96	.29	.63
September-November	13,500	111	56	.82	.42
December-February	13,960	346	75	2.48	.54
March-May	14,600	166	45	1.41	.31
20,000-40,000:					
June-August	29,200	20	194	.07	.66
September-November	24,300	188	74	.77	.30
December-February	30,000	419	97	1.40	.32
March-May	29,200	194	33	.66	.11
40,000-80,000:					
June-August	46,000	20	28	.04	.06
September-November	------	------	------	------	------
December-February	49,600	537	210	1.08	.42
March-May	47,900	337	59	.70	.12

[1] Obtained from groupings of the daily results according to raw-water counts.

On referring to this table it is noted that in a number of cases, particularly during the warmer season, the percentage of bacteria remaining in the chlorinated filter effluent is higher than the corresponding percentage figure for the unchlorinated effluent, this result being due apparently to the effects of secondary bacterial multiplications in the clear-water reservoir. The chlorinated effluent figures, affected as they are by this complicating factor, are probably not representative of the seasonal variation to be expected under normal conditions. As they stand, these figures indicate little variation in the efficiency of purification due to seasonal change, when the effect of chlorination is included. The figures for the unchlorinated filter effluent, however, show a fairly orderly seasonal variation, which is brought out more strikingly by the plot of these percentages in Figure 15.[13] On referring to this chart, it is apparent that the indicated efficiency of bacterial purification, excluding postfilter chlorination, underwent a very orderly cycle of seasonal variation, the efficiency being highest in midsummer and lowest in

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[13] In this plot, the residual percentages corresponding to the three raw-water count groups, 1,001-2,500, 2,501-5,000, and 5,001-10,000, have been recalculated for a single group, 1,001-10,000.

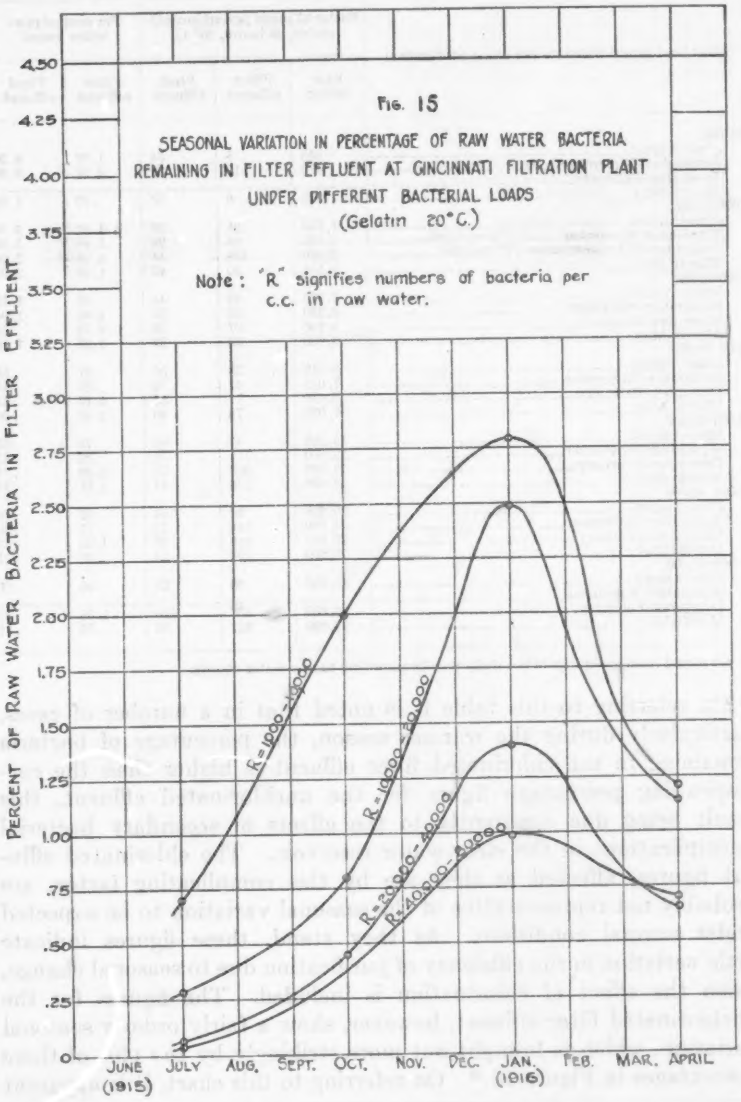

Fig. 15

SEASONAL VARIATION IN PERCENTAGE OF RAW WATER BACTERIA REMAINING IN FILTER EFFLUENT AT CINCINNATI FILTRATION PLANT UNDER DIFFERENT BACTERIAL LOADS (Gelatin 20°C.)

Note: "R" signifies numbers of bacteria per c.c. in raw water.

midwinter. The much greater uniformity of the corresponding figures for the chlorinated filter effluent, though possibly due in part to the effects of secondary bacterial multiplications during the summer

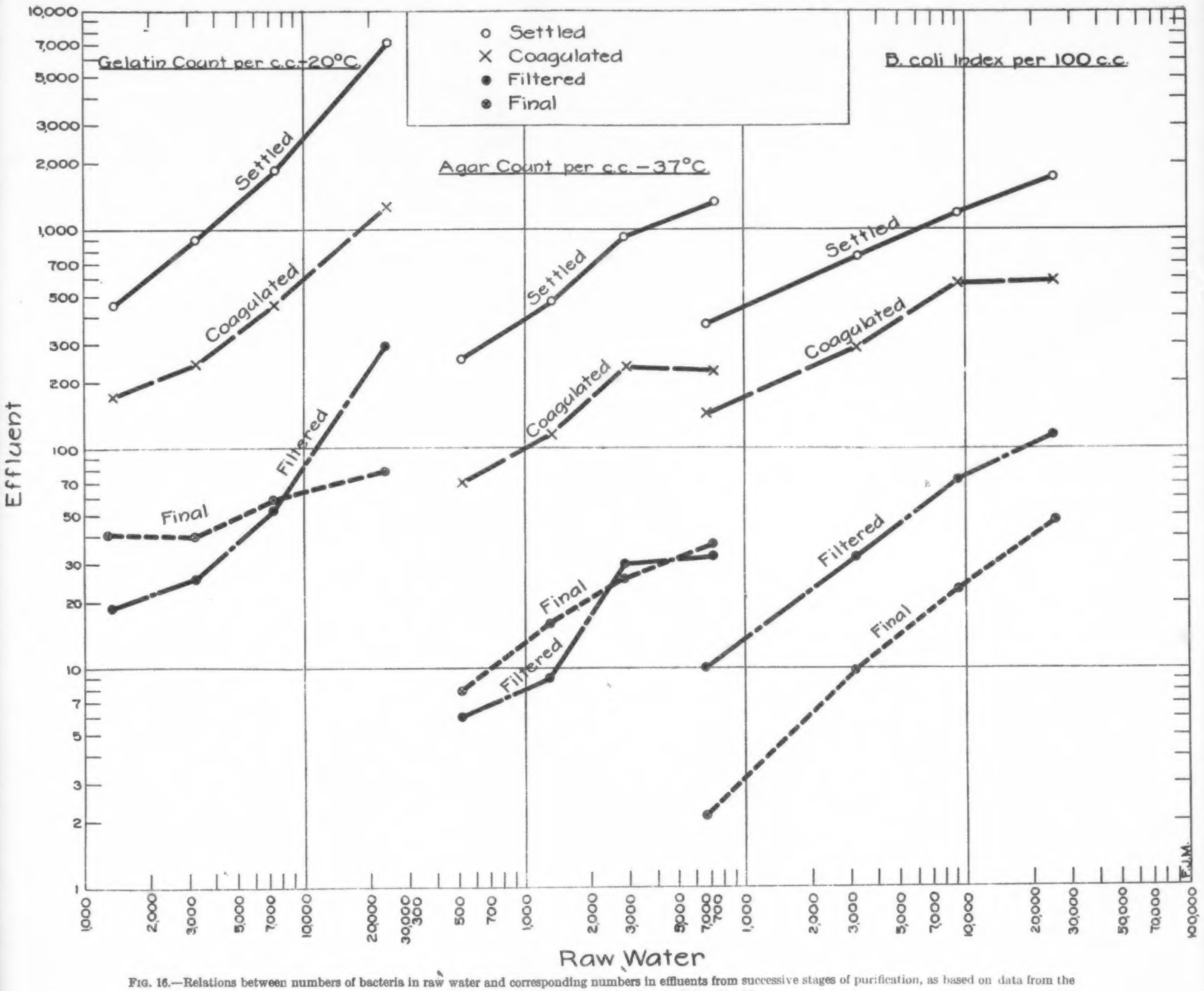

FIG. 16.—Relations between numbers of bacteria in raw water and corresponding numbers in effluents from successive stages of purification, as based on data from the Cincinnati plant. (Plot of data given in Table No. 11)

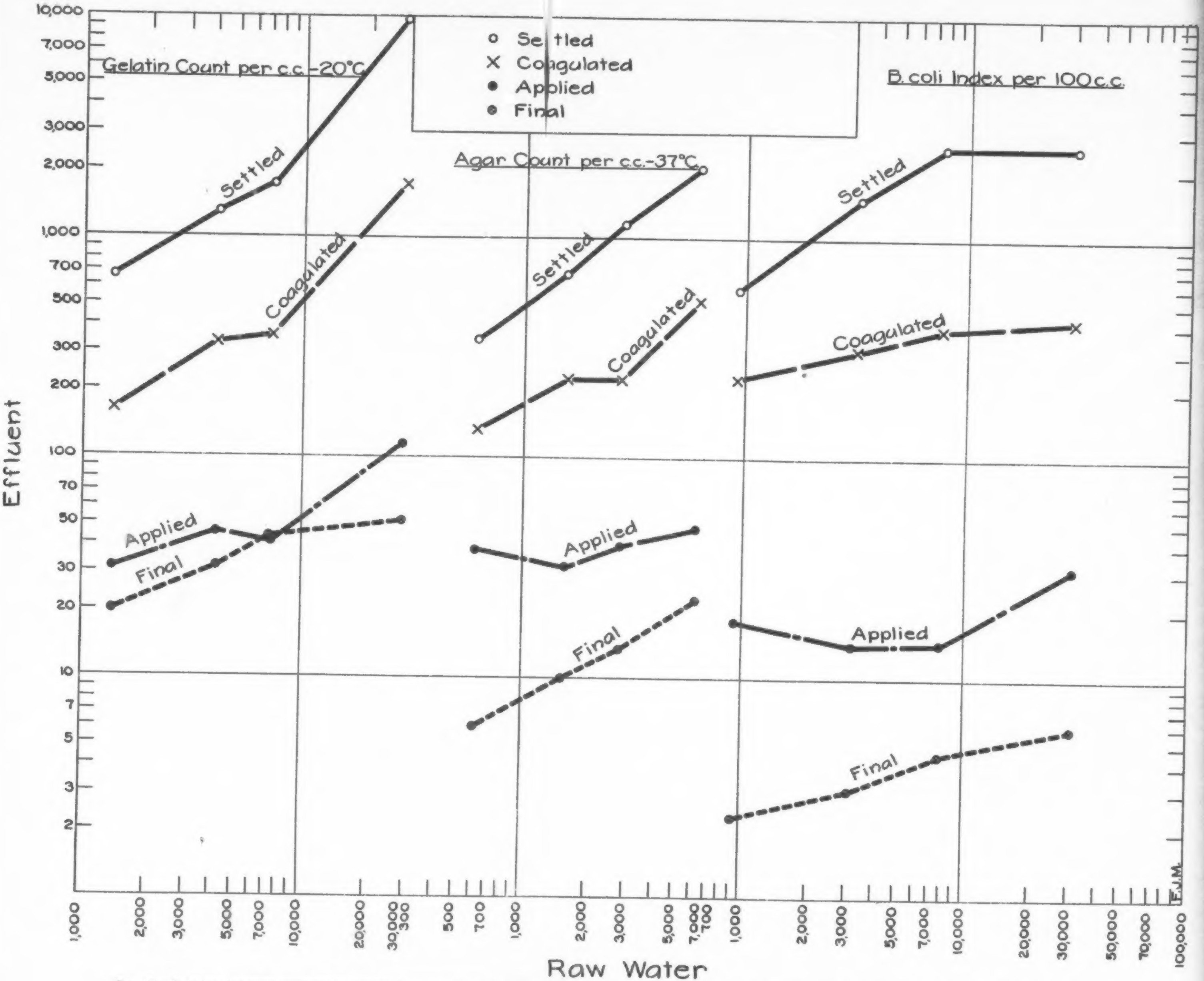

FIG. 17.—Relations between numbers of bacteria in raw water and corresponding numbers of effluents from successive stages of purification, as based on data from the Louisville plant. (Plot of data given in Table No. 11)

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season, would seem to indicate, however, that chlorination had a tendency to offset seasonal variations in the efficiency of the earlier stages of the purification process. In a later section of this report, dealing with the results of the 1923–24 survey of 10 Ohio River plants, it will be shown that the over-all bacterial efficiency of these plants was found to be little influenced by seasonal changes.

Nature of Foregoing Relationships.

The relations observed between the bacterial quality of the raw and influent waters and that of the effluents from various stages of purification, which have been summarized in Tables Nos. 11, 14, and 15, have been shown to be well defined, in spite of their inherent divergences from an entirely smooth trend, due to intrinsic errors of observation and to inevitable departures from normal purification efficiencies, such as would be expected to occur in the case of any water-filtration plant operated under the extremely variable conditions encountered in the purification of Ohio River water. It remains, however, to show the nature of these several relationships and to indicate whether there was found a sufficient degree of parallelism among them to demonstrate the existence of a basic law underlying them.

In undertaking such a demonstration, it should be emphasized that the various observational errors, abnormalities in plant performance, and other uncontrollable conditions, largely biological, causing the divergences in the observed from the true relationships, such as have been above noted, inevitably have combined, in the present case, to produce a relatively wide dispersion of points along the empirical curves defining these relations. In statistical terms, the probable error of these observations, as referred to their true result, has of necessity been relatively high, as compared with those involved in measurements of more exact phenomena.

On plotting the numbers of bacteria observed in the raw water against their corresponding numbers in the various effluents, as given by the figures in Table No. 11, the resulting curves, when plotted on ordinary linear scales, were found to be of the general type illustrated in Figure 13. It will be noted that these curves display a common tendency toward convexity, indicating that as the numbers of bacteria in the raw water increase the corresponding numbers in the effluent tend to increase at a diminishing rate, when measured in terms of bacterial count. The shape of these curves suggesting a logarithmic function, it was found that when the observations were plotted on logarithmic ordinate and abscissa scales their trends had a decided tendency to follow straight lines, as is illustrated in Figures 16 and 17, showing plots of the data given in Table No. 11, and employing logarithmic ordinate and abscissa scales. If the observations given in Table No. 14 for separate stages of purification be plotted in the same manner, the results obtained are similar, as is shown in Figures 18 and 19, in which straight lines have been drawn through the plotted points. In this latter case, where the relationship plotted refers only to a single stage of treatment, it will be noted that the plotted points adhere more closely to a straight-line path than do that portion of the plots in Figure 16 which involve the interposition of one or more intermediate stages between the influent (in this case the raw water) and a particular effluent.

Denoting as (I) the bacterial content of the influent water and as (E) that of the effluent, the following general relations are readily derived from the plots in Figures 18 and 19:

$$\log E = n \log (I) + \log (c) \qquad (1)$$

(c) being the intercept of the plotted straight line on the ordinate corresponding to the logarithm, unity, and (n) being the slope of the line in linear units. From relation (1) we then have:

$$E = cI^n \qquad (2)$$

If the symbol (R) be taken as representing the bacterial content of the raw water, the following relation may be similarly derived from the plots in Figures 16 and 17, by drawing straight lines through the plotted points:

$$E = cR^n \qquad (3)$$

The values of (c) and (n) derived empirically from the foregoing plots define the characteristics of each relationship. The coefficient (c) thus defines, roughly, the order of magnitude of the efficiency of purification delivered by a particular stage of treatment or by a combination of two or more successive stages. The exponent (n) is an index of the relative constancy in the bacterial quality of the effluent obtained under varying degrees of bacterial content of the raw or the influent water. In general, the higher the value of (c), (n) remaining constant, the lower is the average efficiency of purification, and the higher the value of (n), (c) remaining constant, the less uniform is the bacterial character of the effluent. The relation above stated is very similar to that which was found by Wolman[14] to govern the bacterial efficiency of a number of filtration plants in Maryland, though his observation that the value of (c) approached unity with sufficient closeness to be safely disregarded was not confirmed in the present instance, as is indicated by the values of this coefficient derived from logarithmic plots of the data given in Tables Nos. 11, 14, and 15.

In Table No. 18 are tabulated values of (c) and (n) derived from the plots of the influent-effluent relations at separate stages of puri-

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[14] Wolman, Abel., Jour. Am. W. W. Assoc., September, 1918.

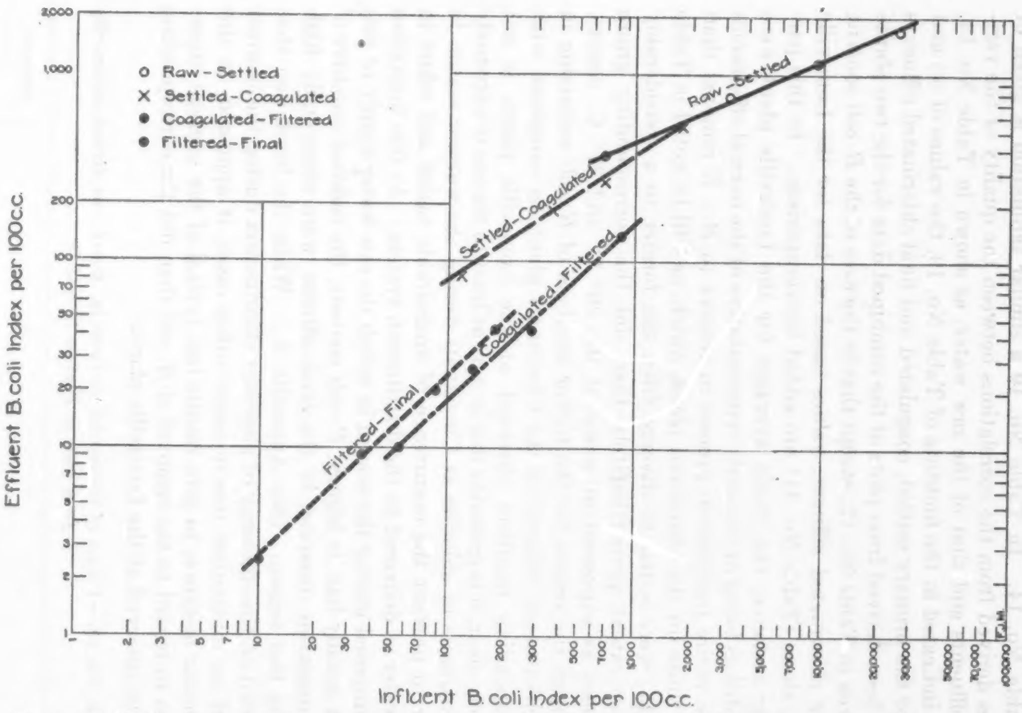

FIG. 18.—Relations between numbers of *B. coli* in influent waters as delivered to separate stages of treatment and corresponding numbers in effluents from the same respective stages, as based on data from the Cincinnati plant. (Plot of data given in Table No. 14)

fication, as shown in Figures 18 and 19 and based on the data given in Table No. 14. In Table No. 19 a similar tabulation is given of values derived from the correlations between the quality of the various effluents and that of the raw water, as shown in Table No. 13. As is indicated in the footnote of Table No. 19, the values of (*c*) and (*n*) for the primary settled, coagulated and final chlorinated effluents have been derived from plots of the combined data for the two plants as given in Table No. 12, except that in the case of the *B. coli* content of the chlorinated effluent, values based on data for the Louisville plant alone (Table No. 11) are added for comparison. In this particular instance, the group averages for the Louisville plant were regarded as being more nearly representative of the normal efficiencies of the entire purification process in respect to *B. coli* removal than were those for the Cincinnati plant, which, as will be noted in Table No. 11, were found to diverge from the former to a considerably greater extent proportionately than did the corresponding group averages as expressed in terms of the 20° C. and 37° C. counts. Although the reason for the higher numbers of *B. coli* remaining in the chlorinated effluent at the Cincinnati plant, as compared with corresponding numbers observed at the Louisville plant, is not entirely clear, it is probably due in part at least to the use of extremely low amounts of chlorine at Cincinnati during the warmer season in order to prevent the occurrence of undesirable tastes and odors in the water as delivered to the distribution system. As this limitation was imposed during the season in which the raw water supply of this plant usually has its highest *B. coli* content, the residual numbers of this organism observed in the final effluent were abnormally high during this season. (See Appendix A.) While the limitation thus imposed on the efficiency of postfilter chlorination during the summer is not an uncommon one in many other cases, it appeared, in this particular instance, to give results less typical of the average expectation in regard to the removal of *B. coli* than did the corresponding results observed at the Louisville plant.

TABLE No. 18.—*Values of (c) and (n) in formula, $E=cI^n$, as derived empirically from plots in Figures 18 and 19*

	Value of—	
	(c)	(n)
Cincinnati plant:		
Primary plain sedimentation	21.2	0.44
Coagulation	3.7	.87
Filtration	.29	.94
Chlorination (postfilter)	.23	.97
Louisville plant:		
Primary plain sedimentation	6.9	.67
Coagulation	2.7	.68
Chlorination (prefilter)	1.7	.39
Filtration	1.2	.34

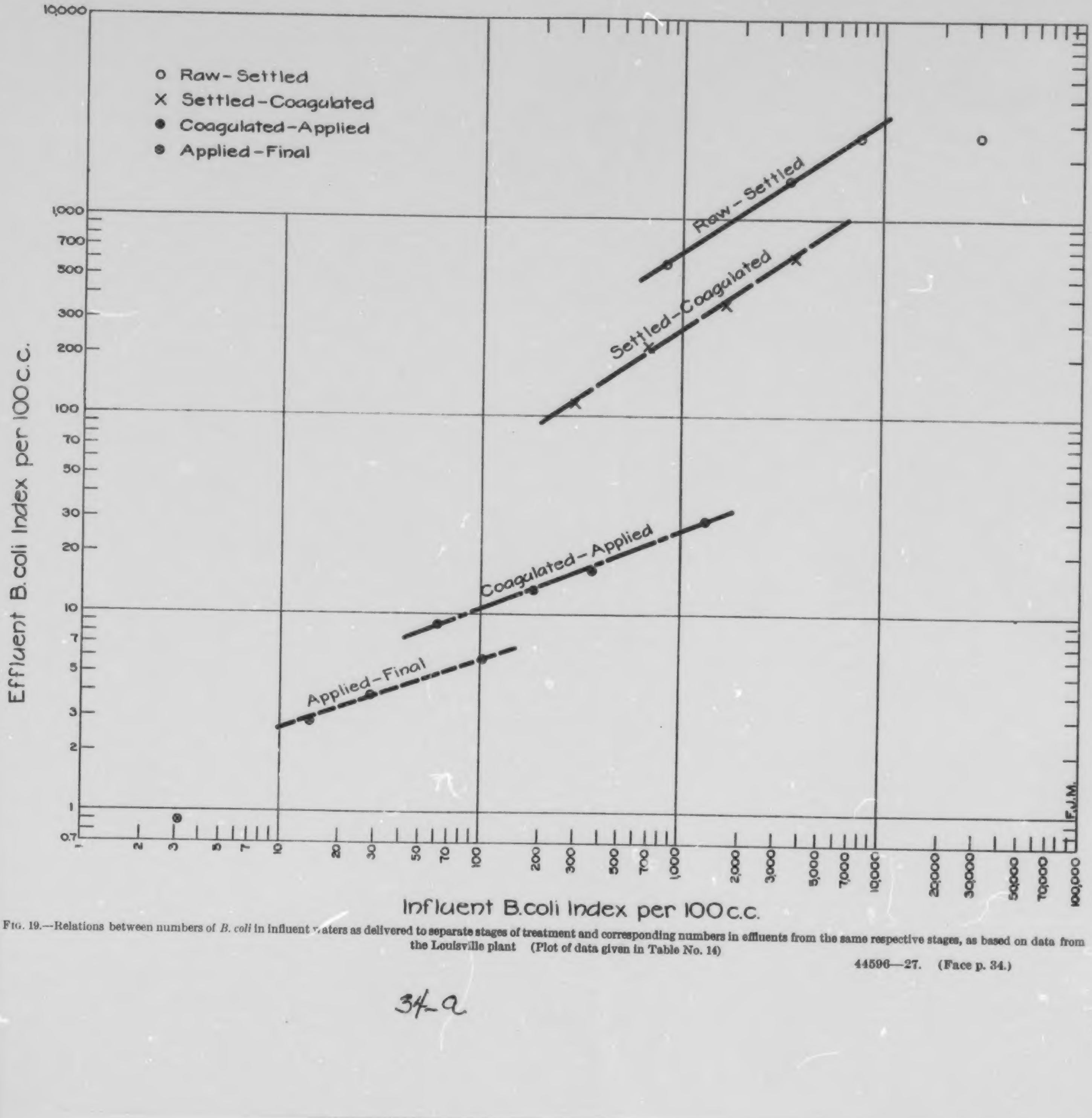

FIG. 19.—Relations between numbers of *B. coli* in influent waters as delivered to separate stages of treatment and corresponding numbers in effluents from the same respective stages, as based on data from the Louisville plant (Plot of data given in Table No. 14)

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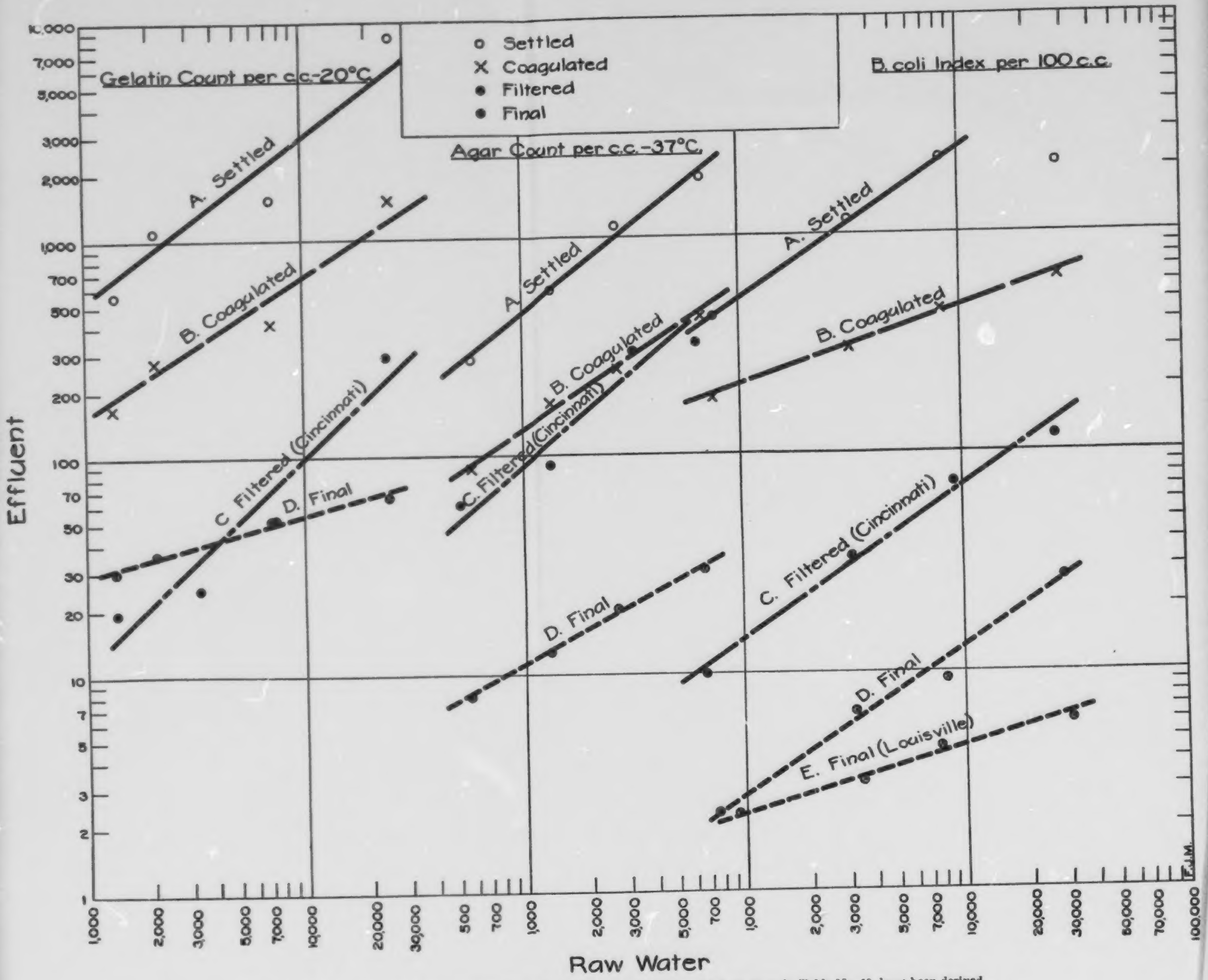

FIG. 20.—Plot of combined data from the two plants, from which values of (c) and (n), as given in Table No. 18, have been derived

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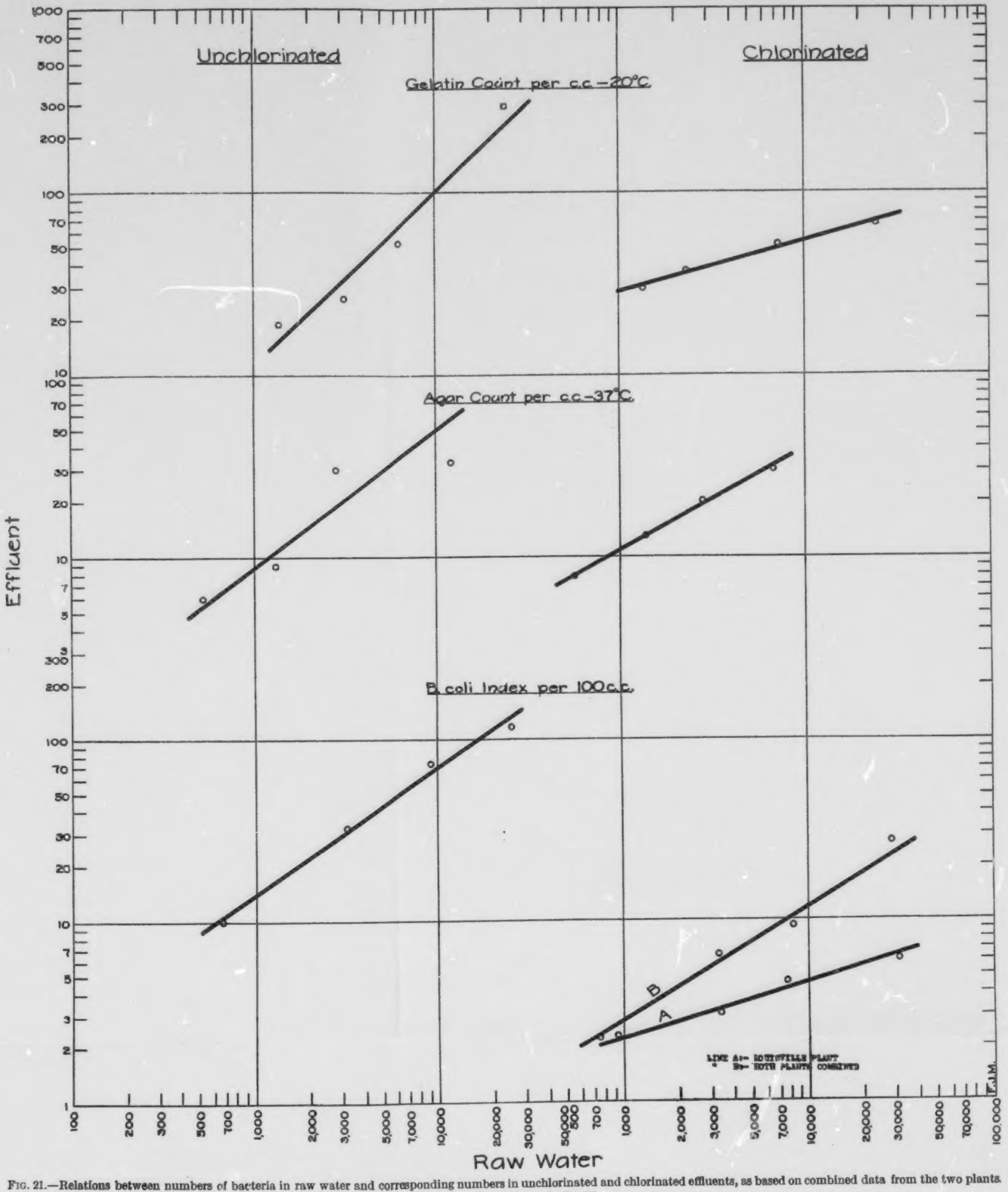

FIG. 21.—Relations between numbers of bacteria in raw water and corresponding numbers in unchlorinated and chlorinated effluents, as based on combined data from the two plants. (Replot of graphs shown in fig. 20)

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Table No. 19.—*Values of (c) and (n) in formula, $E = cR^n$, as derived empirically from plots in Figure 20*

	Value of—	
	(c)	(n)
Gelatin count (48 hours, 20° C.):		
Primary settled water	3.0	0.75
Coagulated water	2.0	.64
Unchlorinated filter effluent	.016	.94
Chlorinated effluent	4.[illegible]	.27
Agar count (24 hours, 37° C.):		
Primary settled water	2.0	.78
Coagulated water	1.6	.66
Unchlorinated filter effluent	.28	.83
Chlorinated effluent	.27	.54
B. coli index:		
Primary settled water	4.6	.68
Coagulated water	19.0	.35
Unchlorinated filter effluent	.12	.69
Chlorinated effluent, line "D"	[1] .29	[1] .30
Chlorinated effluent, line "E"	.043	.61

[1] Based on data for Louisville plant (Table No. 11).

Note.—With the single exception indicated by the ([1]), values of (*c*) and (*n*) for the primary settled, coagulated, and final chlorinated waters have been derived from the combined data for the two plants as given in Table No. 12: values for the unchlorinated filter effluent are based on data for the Cincinnati plant, as given in Table No. 11.

It is further noted in Table No. 19 that the values of (*c*) and (*n*) derived for the unchlorinated filter effluent are based on results for the Cincinnati plant alone. In this connection it is pertinent to recall (see p. 1) that at the time of the 1915–16 observations prefilter chlorination was being employed at the Louisville plant; hence, it was impossible to secure data at the latter plant bearing on the quality of the unchlorinated filter effluent.

On referring to Figure 20, it will be noted that, in general, the relationship between the raw and effluent waters in respect to *B. coli* content is shown to follow more closely the power-function law stated in formulæ (2) and (3) than do the corresponding relations when expressed in terms of the 20° C. and 37° C. bacterial counts. This is evidenced by the measurably greater closeness with which the plotted *B. coli* averages follow a straight-line trend in the majority of cases. The phenomenon thus observed is probably due, in a large measure, to the fact that organisms of the *B. coli* group are not subject to as great an extent to the effects of seasonal and other factors causing quantitative variations unassociated with those of true purification, as is true of bacteria of the wider groups embraced by the 20° C. and 37° C. plate counts. The greater observed compatibility of the *B. coli* results in this respect is, in fact, a strong indication both of the validity of the basic law suggested by the foregoing relationships and of the general consistency of the *B. coli* index, when considered in terms of averages, as a measure of the essential degree of bacterial removal accomplished by water purification plants of the type considered in this report. In this connection it should be noted, however, that in the systematic tests of *B. coli* made during the 1915–16 study, exceptional precautions were taken to reduce to a minimum the slight variations in technique which sometimes produce wide inconsistencies in the quantitative results obtained from *B. coli* tests of this kind. It will be shown in a later section of this report that wherever precautions of such a high degree of nicety as were taken in the present instance are impracticable, the difficulties and uncertainties involved in the proper interpretation of the *B. coli* data are greatly increased.

Applications of Data.

The relationships found to exist between the bacterial quality of the raw water as delivered to the two plants and that of their corresponding effluents at various stages of purification established tentatively a basis for estimating the average limiting concentration of bacteria present in Ohio River water which, under the conditions prevailing at the time of the observations, were consistent with the production of effluents having different specified degrees of bacterial purity. In Table No. 20 are tabulated these limiting concentrations as calculated by employing the values of (*c*) and (*n*) given in Table No. 19. In a similar manner, the limits of permissible bacterial content of the influent waters as delivered to separate stages of purification may be calculated from the value of (*c*) and (*n*) given in Table No. 18; these are omitted, however, for the sake of brevity, since they are not employed in connection with the present phase of the discussion.

TABLE No. 20.—*Calculated maximum numbers of raw water bacteria consistent with the production of filter effluents containing not more than specified numbers of bacteria.*

[Calculated from values of (c) and (n) in Table No. 19]

A. UNCHLORINATED					
Gelatin count, 20° C. (per cubic centimeter)		Agar count, 37° C. (per cubic centimeter)		B. coli index (per 100 c. c.)	
Effluent	Raw water	Effluent	Raw water	Effluent	Raw water
10	890	10	75	1	22
20	1,860	20	170	2	60
30	2,880	30	280	3	106
50	4,900	50	510	4	160
70	7,090	70	770	5	220
100	10,500	100	1,190	7	360
500	56,000	500	8,220	10	600
B. CHLORINATED					
10	[1] 23	10	810	1	[2] 60 [3] 170
20	[1] 270	20	2,900	2	[2] 630 [3] 540
30	[1] 1,200	30	5,800	3	[2] 2,400 [3] 1,050
50	7,600	50	15,900	4	[2] 13,300 [3] 2,420
70	26,000	70	29,500	7	[2] 40,800 [3] 4,370
100	95,000	100	57,600	10	[2] 134,000 [3] 7,620

[1] Inconsistent; due to extrapolation of relationship plot.
[2] Calculated from constants for Louisville plant.
[3] Calculated from constants for two plants combined.

In Table No. 20, the limiting numbers of bacteria in the raw water have been calculated assuming separately an unchlorinated and a chlorinated effluent. The effect of chlorination in increasing the permissible raw-water pollution is strikingly shown by comparison of the raw-water figures corresponding to equivalent numbers of bacteria in the respective types of effluents. Under section B of the table, dealing with chlorinated effluents, the limiting densities of *B. coli* permissible in the raw water have been computed separately on a basis of the combined data for the two plants and on that of the data for the Louisville plant alone. This was done for the purpose of comparing the results obtained by the two methods of calculation, since a further study of the *B. coli* data indicated, as next will be shown, that the values of (*c*) and (*n*) derived from the Louisville data represented more nearly the average efficiency of purification of typical plants in respect to *B. coli* removal than did those based on the combined observations for the two plants.

In order to test the more general applicability of the general formula and empirical constants derived from the foregoing data, a comparison was made of results obtained by calculation with those derived from routine observations at a number of water purification plants of the rapid sand type located in the Mississippi River Basin, laboratory data for which were published by Hinman in 1918.[15] In making this comparison, a calculation was made, from Hinman's raw-water figures for each plant, of what the numbers of bacteria in the effluent would be in each case if the efficiency of purification were assumed to be as defined by the following values of (*c*) and (*n*), taken from Table No. 19:

Chlorinated-filtered effluent	Value of—	
	(c)	(n)
48-hour gelatin count, 20° C	4.4	0.27
24-hour agar count, 37° C	.27	.54
B. coli index (*a*)	.043	.61
B. coli index (*b*)	.29	.30

NOTE.—Under the heading, "*B. coli* index," the values of (*c*) and (*n*) designated as (*a*) and (*b*) are based, respectively, on the combined data for the two plants and on the data for the Louisville plant alone.

The effluent figures thus calculated, as compared with the corresponding observed figures reported by Hinman, are given in Table No. 21, which, with a slight modification,[16] has been transcribed from a table [17] originally published in connection with a paper giving some of the preliminary results of the studies under discussion in this section of the present report.

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[15] Hinman, J. J., jr., Jour. Am. W. W. Assoc., June, 1918, Table No. 2.

[16] The modification consists in the addition of a column giving the results of the *B. coli* calculation employing values of (c) and (*n*) as given above under (*a*), and in the correction of an error in the raw water *B. coli* index for the Evansville plant, to which our attention was kindly drawn by Chief Engineer G. W. Putnam of the Missouri State Board of Health.

[17] Reprint No. 737, from Public Health Reports, Table No. 4.

Table No. 21.—*Comparison of average numbers of bacteria as observed in the effluents of 13 rapid-sand filtration plants in Mississippi Basin and as calculated from the corresponding numbers observed in the respective raw waters, using values of (c) and (n) as given in Table No. 19, and basing the calculation on figures reported by Hinman in 1918* [1]

Plant	48-hour gelatin count per cubic centimeter, 20° C.			24-hour agar count per cubic centimeter, 37° C.			B. coli index per 100 c. c.			
	Raw water	Final effluent		Raw water	Final effluent		Raw water	Final effluent [2]		
		Observed	Calculated		Observed	Calculated [3]		Observed	Calculated (a)	Calculated (b)
Decatur, Ill	7,200	49	49							
Quincy, Ill				2,080	11	17				
Evansville, Ind	1,250	50	30	5,000	45	27	780	7.0	2.1	2.3
Louisville, Ky. [4]	25,000	50	70	8,190	23	21	7,400	4.8	4.1	9.2
Minneapolis, Minn	2,250	24	35	775	7	10	1,500	.2	2.8	3.7
St. Louis, Mo	81,000	170	95	12,000	16	43	3,100	1.7	3.2	5.8
Omaha, Nebr	20,000	60	65	12,000	50	43				
New Orleans, La	2,900	38	38	200	14	5	35	.5	.8	.4
Akron, Ohio	1,830	34	34	246	11	5	130	.9	.6	.6
Alliance, Ohio	5,000	80	44	1,500	40	14	100	3.3	1.1	.7
Cincinnati, Ohio [5]	13,900	48	58	1,920	19	16	2,140	4.6	2.8	4.5
Toledo, Ohio	22,000	34	67				2,340	1.1	2.9	4.9
McKeesport, Pa	3,000	40	39	1,400	7	14				
Average	15,440	56	52	3,660	22	20	10,540	2.7	2.3	3.6

[1] Hinman, J. J., jr., Jour. Am. W. W. Assoc., June, 1918, Table No. 2.

[2] Calculated B. coli figures given in column (a), derived from values of (c) and (n) based on data for Louisville plant alone; corresponding figures in column (b), from values based on combined data for 2 plants.

[3] Figures as given in originally published table revised owing to a slight modification in the values of (c) and (n) employed for the calculation. (See Table No. 19.)

[4] 37° agar and B. coli figures, average of daily results for 1 year.

[5] 37° agar, average of daily results for 1 year; B. coli figures, average for 6 years (1912-1917).

On referring to Table No. 21, comparison of the calculated with the observed figures shows, with a few exceptions, a very reasonable accordance between them, taking into account the various elements which might be expected to cause their divergence in individual cases. The rather surprisingly close agreement between the average figures given at the bottom of the table appears to indicate that the divergence between the individual results is a more or less random one and is not due to any unbalanced source of error in the calculation.

On comparing with the observed *B. coli* results the figures obtained by calculation, the agreement between the observed and the calculated result is shown to be better in six of the nine cases where the constants based on the Louisville data alone are employed. This fact, together with the closer coincidence of the averages in the same instance, would indicate that the values of (*c*) and (*n*), as derived from the Louisville observations, were more nearly representative of the over-all efficiency in *B. coli* removal to be expected of the average purification plant treating water similar to that of the Ohio River than was the case with the values of the two constants based on the combined data for the two plants. It will be shown in the next section of this report that the results of the later survey of a group of 10 municipal plants located along the Ohio River indicated a marked improvement as having taken place, during the past few years, in the efficiency of a number of these plants, including those at Cincinnati and Louisville, in respect to the removal of *B. coli* with the combined aid of filtration and chlorination. At the time of the 1915–16 observations, however, the performance curves derived as has been described in the foregoing text appeared to be fairly characteristic of the average bacterial efficiencies being obtained at that period by a typical group of plants under widely varying average conditions of raw-water pollution.

In this connection it will be noted, on referring to Table No. 20, that the maximum permissible *B. coli* index of the raw water, consistent with the delivery of a final effluent conforming to the original United States Treasury Department standard (two *B. coli* per 100 cubic centimeters) is indicated in column (a) as having been 630 *B. coli* per 100 cubic centimeters. It is possibly a fortuitous, though interesting, circumstance that this figure very nearly coincided with the International Joint Commission standard (500 *B. coli* per 100 cubic centimeters) defining the limiting *B. coli* content of Great Lakes waters as delivered to purification plants for treatment.

PART II

RESULTS OF THE 1923-24 SURVEY OF OHIO RIVER PLANTS

In the introductory section of this report (pp. xix–xx), a brief description has been given of the scope and general plan of the collective survey of the efficiency of municipal filtration plants made in 1923–24.[1] This survey differed in several respects from the preliminary study made at the Cincinnati and Louisville plants in 1915–16,[1] notably in respect to the method followed in collecting the laboratory data. In the earlier study, it will be recalled, systematic laboratory observations were made at each plant by a sanitary bacteriologist employed by the Public Health Service, operating a laboratory equipped and maintained by the service. In the later survey, however, it was not feasible to follow this procedure, owing to the prohibitively large expense that would have been entailed in operating independent laboratories at the 17 plants surveyed; hence it was necessary to arrange for the transmission, by the plant operators, of the laboratory data as ordinarily collected in connection with the operation of their respective plants. Although every effort was made to secure comparable data from the several plants, it was found virtually impossible to harmonize these data to the extent that had been practicable in connection with the 1916 study. This was due to the fact that each plant laboratory, though following a fairly well standardized laboratory technique, had its own individual variations in such procedure, as dictated by custom and by local requirements, and any changes made in the interests of coordination of results with those of other plant laboratories must be made cautiously, in order not to jeopardize the historical comparability of the records for a given plant. In the earlier study, no limitations of this character were imposed and it was possible, therefore, to employ every refinement in technique necessary to make the results obtained at the two laboratories mutually consistent with each other to a high degree and to secure a relatively higher precision of measurement than was possible in the collective survey of 1924.

In view of these circumstances, it was expected that the laboratory data obtained from the survey of 1924 would be subject to a considerably greater margin of error than were those secured in the earlier study. On the other hand, the results obtained in 1924 were much greater in volume and covered a wider range of conditions; hence they were capable of a more satisfactory statistical treatment, in many respects, than was true of those secured in 1916. With the foregoing distinctions in mind, it is proposed to present and discuss in this section of the report the laboratory data obtained from that portion of the survey of 1924 which was concerned with the group of 10 municipal filtration plants located directly on the Ohio River.

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[1] The preliminary study of 1915-16 and the survey of 1923-24 hereafter will be designated in the text by the years 1916 and 1924, respectively, though in each instance the period covered by the observations extended approximately over the second half of the earlier year and the first half of the next year.

For the list of these plants already given (see p. XXI), it will be noted that both the Cincinnati and Louisville plants, which were previously studied, were included in the group surveyed. It will be noted further that the plants thus observed are located along a stretch of the Ohio River, approximately 750 miles in length, extending from East Liverpool, Ohio, situated 44 miles downstream from Pittsburgh, to Henderson, Ky., 794 miles below Pittsburgh. With the exception of the plant at Huntington, W. Va., all of the plants included in the group are municipally owned and operated.[2]

In Appendix C, are given general descriptive data bearing on the location, size, date of construction, population served, and kind of treatment used, at each plant of the group. On comparing the data thus given for the different plants, a wide variation is found among them in respect to the characteristics above noted, excepting as regards the methods of treatment followed, which in every case is practically the same, comprising preliminary sedimentation, coagulation, rapid-sand filtration and chlorination.

For purposes of study, certain important distinctions are to be found, however, in the methods of treatment used at these various plants, particularly as regards those of preliminary treatment of the water prior to its filtration. On referring to Appendix C it will be noted that at 5 of the 10 plants, located, respectively, at Steubenville, Ironton, Portsmouth, Cincinnati, and Louisville, the water is given preliminary sedimentation in two separate stages in series with each other, the primary stage consisting in natural subsidence (i. e. sedimentation unaided by coagulation) at three of the plants, (Steubenville, Cincinnati, and Louisville) and in combined coagulation and sedimentation at two of the plants (Ironton and Portsmouth). At all five of these plants, the secondary stage of sedimentation is aided by continuous coagulation. At the remaining 5 of the 10 plants, comprising those located, respectively, at East Liverpool, Huntington, Ashland, Evansville, and Henderson, preliminary sedimentation of the water is accomplished in a single stage and is aided, in each case, by continuous coagulation.

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[2] The Huntington plant is owned and operated by the Huntington Water Corporation, a subsidiary of the American Water Works & Electric Co.

The foregoing group of plants may be said, therefore, to present three distinct varieties of preliminary treatment, as follows:

(*a*) Two separate stages of sedimentation, both aided by coagulation (Ironton and Portsmouth).

(*b*) Two separate stages of sedimentation, with coagulation at the second stage only (Steubenville, Cincinnati, and Louisville).

(*c*) A single stage of sedimentation aided by coagulation (East Liverpool, Huntington, Ashland, Evansville, and Henderson).

For most practical purposes, however, the plants falling under classes (*a*) and (*b*) may be considered as a single group; hence for purposes of discussion the following classification will be made of them:

Group I: Plants having two separate stages of preliminary sedimentation (Steubenville, Ironton, Portsmouth, Cincinnati, and Louisville).

Group II: Plants having a single stage of preliminary sedimentation (East Liverpool, Huntington, Ashland, Evansville, and Henderson).

On referring to the third table in Appendix C, giving data pertaining to the systems of coagulation used at the various plants, it will be noted that at a majority of the Ohio River plants, aluminum sulphate is used as the coagulant, though in two instances (at East Liverpool and Steubenville, respectively) this chemical is used alternately with ferrous sulphate and lime.[3] At one plant (Cincinnati) lime and sulphate of iron are used exclusively. In other tables given in Appendix C are contained detailed figures concerning the various features of design of the sedimentation basins and filters at the several plants. These data are presented largely for purposes of record and no particular discussion of them is necessary in connection with this report. Before presenting the laboratory data for discussion, it is pertinent, however, to describe briefly the conditions in different zones of the Ohio River affecting the operation of the various plants.

Conditions Surrounding Operations of Ohio River Plants.

In general, the conditions surrounding the operation of the various plants on the Ohio River are similar to those found at purification plants situated on streams of a "flashy" character, receiving fairly large amounts of sewage and other wastes. As a rule the intakes of the Ohio River plants are located upstream from local sewer outfalls and at points approximately midstream. In sections of the river subject to the impounding action of dams, the water is held back during the low stages of the river and accumulated deposits in the slack water sections are frequently flushed out during high water.

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[3] In these two instances, the alternate use of the two kinds of coagulant is necessitated largely by chemical conditions in the extreme upper stretch of the Ohio River which make impracticable the continuous use of either coagulant alone.

Under these circumstances the variability of the raw water as delivered to the plant is greater than in stretches of the river unaffected by dams. At the time of the 1924 survey nearly the entire section of the Ohio River above Cincinnati had been brought under the influence of dams.

In the upper stretches of the river industrial wastes are a greater factor in the operation of the plants than in the lower reaches. At East Liverpool and Steubenville, for example, the raw water frequently is acid because of the effects of mine and steel mill wastes discharged into the Ohio River through the Monongahela and Allegheny Rivers at Pittsburgh. Both of these plants, moreover, have experienced a great deal of difficulty owing to the presence of phenols in their raw-water supplies. At points between Steubenville and Cincinnati similar difficulties are experienced, though they are less frequent in occurrence. In nearly all stretches of the river growths of microscopic plants affect the operation of filters in the summer and autumn periods of low water. The presence of phenols or of microscopic organisms in the river water, when prevalent, causes greater difficulties in the operation of the various plants and in the production of physically satisfactory effluents than do any other single factors involved in the present situation. Although both of these sources of difficulty have an indirect bearing on the problem with which this report deals, a full discussion of them is hardly within the scope of this report.

Presentation of Base Data.

In Appendix A are given detailed summaries of the daily laboratory results reported from the various Ohio River plants during the period covered by the survey. Owing to the limitations of space, the only operation data given in connection with these tables are the daily volumes of water treated. In Table No. 22, however, are given full operation data in terms of monthly averages and laboratory results in similar terms, derived from the daily figures tabulated in Appendix A. The monthly average laboratory data given in Table No. 22 have been further reduced to means and monthly maxima for the entire period of observations in Table No. 23 and for the two seasonal periods, May–October and November–April, in Table No. 24.

TABLE NO. 22.—*Summary of monthly average operation and laboratory results reported from each individual Ohio River plant included in the survey of 1923–24*

EAST LIVERPOOL, OHIO, FILTRATION PLANT

Month	Operation data														
	Average daily volume of water treated	Filter operation				Coagulants (grains per gallon)									Chlorine	Average river stage
		Average length run	Washing			Alum			Iron sulphate			Lime or soda				
			Per cent wash water	Average itme	Rate (inches per minute)	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum		
	1,000 gals.	*Hours*		*Minutes*											*P. p. m.*	*Feet*
July	4,045	46	1.23	5.0	----------	0.6	1.1	0.4	----------	----------	----------	0.6	0.8	0.3	0.24	12.5
August	4,137	37	1.64	4.7	24	.6	1.1	.2	----------	----------	----------	.6	.9	.2	.24	12.5
September	4,126	51	1.39	4.6	----------	.5	1.0	.4	----------	----------	----------	.3	.9	.0	.23	----------
October	4,075	48	1.60	4.4	24	.5	.9	.2	----------	----------	----------	.5	1.0	.2	.19	----------
November	3,688	37	2.00	5.0	----------	.9	1.6	.3	----------	----------	----------	1.0	2.2	.2	.22	----------
December	3,622	26	2.70	4.8	24	1.0	1.8	.3	0.5	1.4	0.3	.6	.8	.5	.36	17.2
January	4,055	25	2.74	4.8	----------	1.4	2.3	.7	----------	----------	----------	.7	1.7	.3	.29	14.8
February	3,830	28	2.24	4.6	24	1.3	3.1	.8	----------	----------	----------	.7	1.3	.4	.7	12.7
March	3,757	26	2.70	4.8	24	1.7	3.8	1.0	----------	----------	----------	.7	1.0	.4	.31	17.5
April	3,696	23	2.70	4.1	24	1.7	2.5	1.0	----------	----------	----------	.6	.9	.4	.31	16.7
May	3,570	25	2.50	4.6	----------	1.7	3.4	1.0	----------	----------	----------	.7	.9	.5	.33	18.6
June	3,890	24	2.60	5.0	----------	1.3	4.3	.7	----------	----------	----------	.6	.8	.3	.29	15.5
Average	3,870	33	2.17	4.7	24	1.1	2.2	.6	.5	1.4	.3	.6	1.1	.3	.31	15.3
Maximum	4,137	51	2.74	5.0	24	1.7	4.3	1.0	.5	1.4	.3	1.0	2.2	.5	.7	18.6
Minimum	3,570	23	1.23	4.1	24	.5	.9	.2	.5	1.4	.3	.3	.8	.0	.19	12.5

Month	Laboratory data																				
	Water temperature	Turbidity			Alkalinity		Bacterial count per cubic centimeter (agar, 48 hours, 30° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 cubic centimeter				
		Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
	° C.																				
July	25.0	22	------	11	17	19	------	------	------	------	------	6,690	------	958	252	2.0	28	------	58	3.9	1.9
August	26.0	19	------	10	19	19	------	------	------	------	------	5,700	------	891	395	14.0	140	------	36	2.1	.2
September	22.0	19	------	8	16	16	------	------	------	------	------	3,050	------	1,080	356	.5	18	------	256	.8	.1
October	16.0	16	------	8	15	18	------	------	------	------	------	2,470	------	939	155	27.0	224	------	574	1.6	.7
November	9.0	31	------	7	13	19	------	------	------	------	------	3,680	------	714	101	22.0	1,400	------	286	1.0	0
December	7.0	332	------	22	18	23	------	------	------	------	------	6,330	------	938	137	60.0	3,890	------	3,590	3.8	1.3
January	2.5	414	------	21	12	19	------	------	------	------	------	2,670	------	250	22	15.0	3,290	------	1,270	1.4	.3
February	2.5	252	------	11	12	16	------	------	------	------	------	1,500	------	116	8	1.0	1,660	------	325	.7	0
March	4.3	350	------	15	16	19	------	------	------	------	------	2,030	------	160	13	1.0	4,680	------	1,350	2.7	.1
April	9.0	147	------	8	15	19	------	------	------	------	------	2,830	------	283	24	1.0	3,300	------	1,430	3.7	.7
May	--------	216	------	10	17	22	------	------	------	------	------	7,400	------	772	120	4.0	11,600	------	1,890	2.5	.4
June	19.0	200	------	11	19	25	------	------	------	------	------	8,760	------	1,590	586	85.0	1,950	------	1,070	2.6	.5
Average	12.0	168	------	12	16	19	------	------	------	------	------	4,420	------	724	180	19.0	2,680	------	986	2.2	.5
Maximum	26.0	414	------	22	19	23	------	------	------	------	------	8,760	------	1,590	586	85.0	11,600	------	3,590	3.9	1.9
Minimum	2.5	16	------	8	12	16	------	------	------	------	------	1,500	------	160	8	1.0	18	------	36	.7	0

TABLE No. 22.—*Summary of monthly average operation and laboratory results reported from each individual Ohio River plant included in the survey of 1923–24*—Continued

STEUBENVILLE, OHIO, FILTRATION PLANT

Month	Operation data														
	Average daily volume of water treated	Filter operation				Coagulants (grains per gallon)									Chlorine	Average river stage
		Average length run	Washing			Alum			Iron sulphate			Lime or soda				
			Per cent wash water	Average time	Rate (inches per minute)	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum		
	1,000 gals.	*Hours*		*Minutes*											*P. p. m.*	*Feet*
July	4,790	50	1.3	9	16				0.9	1.2	0.6	1.2	1.7	0.8	[1] 0.55	....
August	4,765	50	....	....	....	....	....	....	1.2	1.8	.8	1.6	2.3	.9	[1] .59	....
September	4,730	51	....	9	16	1.0	1.2	0.8	1.1	1.8	.7	1.8	3.4	1.1	[1] .48	....
October	4,450	55	....	9	16	....	....	....	.9	1.2	.5	1.7	2.3	1.2	[1] .47	....
November	4,097	51	....	....	....	....	....	....	1.1	1.6	.7	1.7	3.5	1.1	[1] .33	....
December	4,174	48	....	....	....	....	....	....	1.4	2.2	.9	1.4	1.7	.8	.19	....
January	4,410	59	....	9	16	1.4	2.0	.8	....	....	....	.8	1.6	.3	.18	....
February	4,363	52	1.7	9	16	.8	1.3	.4	....	....	....	1.0	1.4	.7	.15	....
March	4,261	51	1.6	9	16	.8	1.2	.6	....	....	....	.8	1.1	.6	[1] .30	....
April	4,150	48	1.7	9	16	1.4	3.3	.8	....	....	....	.8	1.3	.6	[1] .46	....
May	4,250	47	2.4	9	16	1.6	3.1	.8	....	....	....	1.1	2.1	.6	.24	....
June	4,955	39	1.9	9	15	1.0	1.8	.6	....	....	....	1.0	1.7	.7	.21	....
Average	4,450	50	1.8	9	16	1.2	2.0	.7	1.1	1.6	.7	1.2	1.8	.8	.28	....
Maximum	4,955	59	2.4	9	16	1.6	3.3	.8	1.4	2.2	.9	1.8	3.5	1.2	.59	....
Minimum	4,097	39	1.3	9	15	.8	1.2	.4	.9	1.2	.5	.8	1.1	.3	.15	....

Month	Laboratory data																			
	Water temperature	Turbidity			Alkalinity		Bacterial count per cubic centimeter (agar, 48 hours, 30° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 cubic centimeter				
		Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
	°C.																				
July	27	22	8	7.0	6.0	[2] 19			332	185		1,030	740	82	77	2	526			0.2	0.0
August	27	12	6	6.0	5.0	[2] 19			206	355		330	210	18	110	0	58			.1	.1
September	24	10	7	6.0	5.0	[2] 18			390	740		1,000	195	62	113	1	782			.3	0
October	17	13	7	6.0	4.0	[2] 17			90	80		490	150	25	5	1	49			.1	0
November	10	13	9	8.0	12.0	[2] 18			211	63		1,380	900	210	10	9	57			.4	.2
December	8	85	49	17.0	9.0	[2] 21			1,000	320		980	600	143	11	1	734			.6	.4
January	4	106	56	12.0	5.0	[2] 9			137	32		580	148	46	4	1	214			.8	.6
February	5	49	21	8.0	6.0	[2] 16	[3] 656	[3] 351	97	[3] 193	218	128	41	8	3	0	94	15	4.0	.6	.1
March	7	61	50	12.0	6.0	[2] 19	1,450	1,650	390	130	81	280	49	12	1	1	48	40	5.7	.5	.3
April	11	74	41	13.0	7.0	[2] 20	1,470	1,220	361	199	5	550	62	16	2.1	0.3	83	36	15.0	1.0	.4
May	16	97	43	14.0	9.0	[2] 23	2,400	1,600	600	300	2	720	180	55	5	0	324	523	153.0	2.2	.3
June	23	67	32	7.0	9.0	[2] 24	2,300	3,100	724	375	89	1,690	1,400	284	127	9	1,010	185	99.0	.7	.1
Average	15	51	27	9.7	6.9	[2] 19	1,850	1,580	379	248	79	763	390	80	39	2.1	333	160	55.0	.6	.2
Maximum	27	106	56	17.0	22.0	[2] 24	2,400	3,100	1,000	740	218	1,690	1,400	284	127	9	1,010	523	153.0	2.2	.6
Minimum	4	10	6	6.0	4.0	[2] 9	656	351	97	63	2	128	41	8	1	0	48	15	4.0	.1	0

[1] Calcium hypochlorite used, either in whole or in part.

[2] Filtered.

[3] Began Feb. 20.

TABLE NO. 22.—*Summary of monthly average operation and laboratory results reported from each individual Ohio River plant included in the survey of 1923–24*—Continued

HUNTINGTON, W. VA., FILTRATION PLANT

Month	Operation data															
	Average daily volume of water treated	Filter operation				Coagulants (grains per gallon)									Chlorine	Average river stage
		Average length run	Washing			Alum			Iron sulphate			Lime or soda				
			Per cent wash water	Average time	Rate (inches per minute)	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum		
	1,000 gals.	*Hours*		*Minutes*											*P. p. m.*	*Feet*
July	4,603		2.0	10		1.0	1.5	0.6				0.5	0.8	0.3	0.44	
August	4,490		2.2	10		1.6	2.8	.8				.7	.8	.4	.53	
September	4,416		2.4	10		.8	1.2	.6				.5	.8	.4	.52	
October	4,203		2.1	10		.5	.6	.5				.5	.6	.4	.56	
November	3,863		2.8	10		.8	1.1	.5				.6	.8	.5	.64	
December	3,825		2.8	10		1.8	3.3	1.1				.6	1.0	.6	.59	
January	4,220		2.8	10		1.9	2.9	.9				.8	1.0	.6	.47	
February	4,160		2.5	10		1.1	2.4	.8				.7	.9	.6	.42	
March	3,941		2.4	10		1.2	2.2	.9				.7	1.0	.5	.44	
April	3,883		2.5	10		1.0	2.2	.6				.6	.8	.5	.45	
May	3,971		2.4	10		1.1	1.6	.7				.6	.8	.4	.45	
June	4,132		2.4	10		1.2	2.9	.8				.6	.8	.4	.44	
Average	4,143		2.5	10		1.2	2.1	.7				.7	.9	.5	.49	
Maximum	4,606		2.8	10		1.9	3.3	1.1				.8	1.0	.6	.64	
Minimum	3,825		2.0	10		.5	.6	.5				.5	.6	.3	.42	

Month	Laboratory data																				
	Water temperature	Turbidity			Alkalinity		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 cubic centimeter				
		Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
	°C.																				
July		224		20	31	[1] 31						1,390		448	18.0	2.9	1,000			78	0.2
August		408		21	30	[1] 31						3,450		948	31.0	2.1	1,000			96	.6
September		59		14	42	[1] 44						2,610		964	30.0	2.1	964			70	.1
October		23		9	43	[1] 46						694		269	8.0	1.3	499			45	.2
November		68		14	34	[1] 39						1,640		654	22.0	1.5	964			68	3.0
December		322		18	22	[1] 25						2,280		671	23.0	1.5	3,900			47	1.6
January		334		17	12	[1] 16						2,180		630	16.0	1.4	5,280			22	1.0
February		184		15	17	[1] 21						1,190		330	8.8	2.2	2,330			12	1.5
March		187		17	27	[1] 30						938		353	12.0	1.6	2,220			36	.5
April		168		12	27	[1] 30						722		207	5.5	1.0	2,640			47	.6
May		166		14	24	[1] 27						1,450		292	7.3	.7	3,320			30	0
June		310		15	32	[1] 32						551		155	5.7	.7	4,280			28	.2
Average		204		16	28	[1] 31						1,590		493	16.0	1.6	2,370			48	.8
Maximum		408		21	43	[1] 46						3,450		964	31.0	2.9	5,280			96	1.6
Minimum		23		9	12	[1] 16						551		155	5.5	.7	499			12	0

[1] Filtered.

TABLE No. 22.—*Summary of monthly average operation and laboratory results reported from each individual Ohio River plant included in the survey of 1923–24*—Continued

ASHLAND, KY., FILTRATION PLANT

Month	Operation data															
	Average daily volume of water treated	Filter operation				Coagulants (grains per gallon)									Chlorine	Average river stage
		Average length run	Washing			Alum			Iron sulphate			Lime or soda				
			Per cent wash water	Average time	Rate (inches per minute)	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum		
	1,000 gals.	*Hours*		*Minutes*											*P. p. m.*	*Feet*
July	1,210	6.2		9.0		1.1	2.5	0.5				0.6	1.0	0.5	0.16	
August	1,230	13.0		7.0	22.5	.7	2.0	.5				1.6	2.5	.5	.27	8.95
September	1,099	12.5		9.6		1.4	2.3	.1				.1	.3	0	.29	4.6
October	1,209	12.8		13.7		1.2	2.1	.0							.31	3.1
November	1,210	13.1		3.9		1.6	3.6	.8							.39	[illegible]
December	1,065	11.6		5.2		2.3	4.2	1.7				.4	.9	0	.26	26.8
January	1,305	15.0		5.5		2.4	3.9	1.1				.3	.8	.1	.16	35.4
February	1,280	12.2		5.3		2.4	5.3	.7				1.1	2.7	.6	.18	21.1
March	1,225	11.1		5.0		2.7	5.3	.9				1.3	1.4	.5	.22	26.7
April	1,110	10.8		5.3		2.6	4.3	1.3				.8	2.2	.2	.18	26.6
May	1,188	10.2		5.9		2.8	5.6	1.2				1.0	1.4	.6	.27	29.1
June	1,261	11.1		10.3		3.7	5.7	2.2				1.4	2.2	.5	.25	17.5
Average	1,283	11.6		7.1		2.1	3.9	.9				.9	1.5	.4	.24	18.94
Maximum	1,305	15.0		13.7		3.7	5.7	2.2				1.6	2.7	.6	.39	35.4
Minimum	1,065	6.2		3.9		.7	2.0	.0				.3	.3	0	.16	3.1

Month	Laboratory data																			
	Water temperature	Turbidity			Alkalinity		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 cubic centimeter				
		Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
	°C.																				
July	------	432	------	------	15	------	------	------	------	------	------	397	------	87	5.5	0.6	1,000	------	100	2.3	0.3
August	25.0	459	------	17.0	23	21	------	------	------	------	------	1,350	------	100	12.0	.4	6,520	------	5,500	3.7	.3
September	23.0	606	------	13.0	43	38	------	------	------	------	------	1,270	------	215	63.0	.7	10.400	------	3,740	10.0	.1
October	18.0	27	------	9.2	40	35	------	------	------	------	------	520	------	142	8.3	.1	10,900	------	1,420	6.2	.2
November	7.9	93	------	11.0	34	26	------	------	------	------	------	1,290	------	159	6.3	.3	6,320	------	1,170	6.8	0
December	6.9	510	------	15.0	25	16	------	------	------	------	------	1,490	------	117	2.1	.3	3,410	------	51	1.7	0
January	3.0	500	------	15.0	19	17	------	------	------	------	------	1,250	------	56	1.9	.2	4,220	------	65	2.6	0
February	2.7	272	------	15.0	25	20	------	------	------	------	------	1,030	------	52	1.8	1.1	2,600	------	168	4.9	.1
March	5.6	252	------	22.0	21	14	------	------	------	------	------	731	------	136	6.6	2.9	1,900	------	204	1.2	0
April	13.0	260	------	19.0	23	19	------	------	------	------	------	856	------	180	7.7	1.6	32,800	------	732	1.4	0
May	15.0	393	------	15.0	24	17	------	------	------	------	------	920	------	46	5.6	1.1	16,000	------	1,220	.8	0
June	22.0	895	------	22.0	29	22	------	------	------	------	------	1,390	------	87	11.0	1.3	41,700	------	2,800	.6	0
Average	13.0	392	------	14.0	27	20	------	------	------	------	------	1,040	------	115	11.0	.9	11,500	------	1,430	3.5	.1
Maximum	25.0	895	------	22.0	43	38	------	------	------	------	------	1,490	------	215	63.0	2.9	41,700	------	5,500	10.0	.3
Minimum	2.7	27	------	9.2	15	14	------	------	------	------	------	397	------	46	1.8	.1	1,000	------	51	.6	0

Table No. 22.—*Summary of monthly average operation and laboratory results reported from each individual Ohio River plant included in the survey of 1923–24*—Continued

IRONTON, OHIO, FILTRATION PLANT

Month	Operation data															
	Average daily volume of water treated	Filter operation				Coagulants (grains per gallon)									Chlorine	Average river stage
		Average length run	Washing			Alum			Iron sulphate			Lime or soda				
			Per cent wash water	Average time	Rate (inches per minute)	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum		
	1,000 gals.	*Hours*		*Minutes*											*P. p. m.*	*Feet*
July	1,836	8.3	-------	23.0	24	2.9	4.0	2.2	-------	-------	-------	0.9	1.2	0.6	0.17	-------
August	1,678	12.8	4.22	14.2	24	3.6	5.3	2.7	-------	-------	-------	.9	1.3	0.0	.18	-------
September	1,380	11.3	5.1	14.5	-------	3.4	4.5	2.3	2.0	2.7	1.3	[4]1.5 .6	3.4 .4	.9 .3	.17	5.4
October	1,270	15.6	5.3	13.5	24	3.3	5.1	1.8	2.0	3.1	1.1	[4]1.4 .3	2.0 .9	.2 0	.20	3.0
November	1,420	6.1	5.2	4.0	24	2.5	4.3	1.5	1.5	2.6	1.0	[4]1.0 .5	1.7 .7	.5 .3	.16	-------
December	1,324	11.4	5.7	4.0	24	3.3	5.7	2.1	2.0	2.9	1.2	[4]1.3 .7	2.5 1.2	.9 .5	.17	24.4
January	1,386	14.0	5.1	4.0	24	3.6	6.9	2.3	2.3	4.0	1.4	[4]1.2 1.0	2.0 1.6	.7 .5	.20	32.4
February	1,350	14.0	5.0	4.0	24	2.8	4.0	1.7	2.0	3.0	1.0	[4].8 1.2	1.2 2.0	.5 .5	.25	-------
March	1,342	20.0	3.3	4.0	-------	3.4	4.4	2.7	2.4	3.3	1.6	[4]1.0 1.2	1.2 1.8	.7 1.0	.16	-------
April	1,349	12.0	4.5	4.0	24	3.3	4.6	2.3	2.4	3.2	1.7	[4].8 1.1	2.0 1.7	.6 .7	.21	-------
May	1,140	11.0	4.0	4.0	24	3.4	4.8	2.4	2.2	3.4	1.2	[4]1.2 1.2	1.7 1.6	.7 .7	.21	-------
June	1,300	14.0	4.0	4.0	24	3.8	5.8	2.8	2.4	3.3	1.8	[4]1.4 1.2	2.8 2.0	1.0 .6	.21	-------
Average	1,398	12.5	4.3	8.1	24	3.4	4.9	2.2	2.1	3.1	1.3	[4]1.2 .9	2.0 1.4	.7 .5	.19	16.3
Maximum	1,836	15.6	5.7	23.0	24	3.8	6.9	2.8	2.4	4.0	1.8	[4]1.5 1.2	3.4 2.0	1.0 1.0	.25	32.4
Minimum	1,140	6.1	3.3	4.0	24	2.5	4.0	1.5	1.5	2.6	1.0	[4].8 .3	1.2 .4	.2 .0	.16	3.0

Month	Laboratory data																				
	Water temperature	Turbidity			Alkalinity		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
		Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered unchlorinated	Filtered chlorinated
	° C.																				
July	24	280	43	15	30	27	11,300	1,540	305	11.0	5.8	10,000	1,620	342	20.0	3.0	[5] 1,000	[5] 100	[5] 100	4.3	0
August	24	426	41	15	26	23	7,600	660	128	6.0	1.9	9,590	809	135	8.0	2.2	[5] 23,900	[5] 2,530	[5] 176	2.5	0
September	22	66	33	15	40	24	4,000	440	108	18.0	2.0	4,700	690	140	12.0	1.7	[5] 19,100	[5] 2,490	[5] 257	3.4	.1
October	17	22	28	14	40	30	4,570	421	154	6.5	2.5	4,630	430	120	7.3	3.3	[5] 17,100	[5] 2,120	[5] 328	1.9	.2
November	11	94	33	15	40	27	4,000	690	213	4.8	1.5	3,550	290	90	1.6	.7	[5] 13,500	[5] 2,280	[5] 283	1.2	0
December	8	404	44	15	24	16	23,000	3,700	660	22.0	3.5	2,230	300	109	1.4	.6	[5] 15,700	[5] 1,590	[5] 134	.8	0
January	2	350	39	15	20	14	37,400	2,340	724	27.0	2.7	3,300	240	60	.5	.2	[5] 13,100	[5] 776	[5] 124	.4	.1
February	2	300	36	15	23	20	35,700	3,130	1,020	72.0	10.0	1,420	200	58	1.5	.2	[5] 13,000	[5] 610	[5] 109	1.4	.3
March	4	180	31	14	25	25	46,600	3,600	990	100.0	8.7	1,470	157	40	1.3	.8	[5] 12,900	[5] 710	[5] 58	.6	.2
April	10	194	37	15	24	20	28,600	2,400	664	45.0	1.3	2,010	213	81	2.1	1.0	[5] 9,930	[5] 726	[5] 95	1.0	0
May	14	197	36	14	23	20	22,200	1,550	470	15.0	2.2	2,640	330	104	1.4	1.4	[5] 12,100	[5] 1,050	[5] 87	.8	0
June	21	330	39	14	32	25	10,700	979	280	11.0	2.8	4,760	450	170	4.0	.8	[5] 13,800	[5] 1,150	[5] 127	1.1	.1
Average	13	237	37	15	29	23	19,600	1,790	476	28.0	3.7	4,190	477	121	5.1	1.3	[5] 14,900	[5] 1,460	[5] 162	1.6	.1
Maximum	24	426	44	15	40	30	46,600	3,600	1,020	100.0	5.8	10,000	1,620	342	20.0	3.3	[5] 23,900	[5] 2,530	[5] 328	4.3	.3
Minimum	2	22	28	14	20	14	4,000	421	108	4.8	1.0	1,420	157	40	.5	.2	[5] 9,930	[5] 610	[5] 58	.4	0

[4] Soda used.

[5] Omitted from average.

TABLE No. 22.—*Summary of monthly average operation and laboratory results reported from each individual Ohio River plant included in the survey of 1923–24*—Continued

PORTSMOUTH, OHIO, FILTRATION PLANT

Month	Operation data															
	Average daily volume of water treated	Filter operation				Coagulants (grains per gallon)									Chlorine	Average river stage
		Average length run	Washing			Alum			Iron sulphate			Lime or soda				
			Per cent wash water	Average time	Rate (inches per minute)	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum		
	1,000 gals.	*Hours*		*Minutes*											*P. p. m.*	*Feet*
July	5,072	35	1.7	4	12.0	1.6	2.4	1.1	--------	--------	--------	--------	--------	--------	0.23	--------
August	5,822	19	2.2	4	12.0	2.1	3.4	1.4	--------	--------	--------	0.2	0.8	0.1	.23	--------
September	5,624	14	2.9	3	12.0	2.1	3.1	1.7	--------	--------	--------	.7	1.0	.4	.22	--------
October	5,485	20	1.9	2	--------	2.2	3.8	1.4	--------	--------	--------	.8	1.6	.3	.19	--------
November	5,154	19	1.9	4	12.5	2.1	3.4	1.5	--------	--------	--------	.3	.6	.2	.16	--------
December	5,770	22	1.8	4	12.5	1.4	2.3	.9	--------	--------	--------	.7	1.1	.2	.15	--------
January	6,684	24	1.6	4	12.4	1.6	3.0	1.0	--------	--------	--------	.6	.9	.3	.16	--------
February	6,184	19	1.8	4	12.4	1.6	2.8	1.0	--------	--------	--------	.6	.9	.4	.15	--------
March	5,510	25	1.6	4	12.4	1.4	2.6	1.1	--------	--------	--------	.5	.7	.3	.16	--------
April	5,530	29	1.7	--------	--------	1.3	2.5	.7	--------	--------	--------	.4	.7	.3	.17	--------
May	5,345	42	1.4	4	12.5	1.0	1.4	.7	--------	--------	--------	.4	.6	.2	.19	--------
June	5,408	43	1.3	4	12.3	1.8	3.6	.9	--------	--------	--------	.4	.8	0	.20	--------
Average	5,632	26	1.8	4	12.3	1.7	3.2	1.1	--------	--------	--------	.5	.8	.2	.18	--------
Maximum	6,684	43	2.9	4	12.5	2.2	3.8	1.7	--------	--------	--------	.8	1.6	.4	.23	--------
Minimum	5,072	14	1.3	2	12.0	1.0	1.4	.7	--------	--------	--------	.3	.6	0	.15	--------

Month	Laboratory data																				
	Water temperature	Turbidity			Alkalinity		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
		Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
	° C.																				
July	28	159	24	11	32	[1] 22	3,460	428	280	14	0.0	1,980	370	256	11.0	0.0	6,200	700	170	1.7	0.0
August	26	290	26	13	33	[1] 23	6,720	865	651	28	0	3,650	652	505	22.0	0	3,900	565	80	2.9	.1
September	25	21	7	4	38	[1] 38	1,410	428	369	26	.1	1,260	408	347	26.0	0	1,000	353	73	3.1	.1
October	20	15	5	4	44	[1] 46	1,840	365	226	48	.6	1,510	338	192	27.0	.2	798	118	54	4.6	0
November	11	59	19	7	37	[1] 30	5,010	1,410	513	38	.1	918	418	122	3.4	0	2,500	460	70	2.3	0
December	9	220	24	11	29	[1] 19	32,100	3,240	1,970	181	.4	1,260	238	144	.4	0	5,060	419	45	.1	0
January	5	203	24	11	31	[1] 35	12,800	1,480	977	163	2.9	699	112	65	.2	0	1,520	88	51	.4	0
February	5	160	22	9	33	[1] 33	10,800	1,410	892	101	1.0	650	76	38	.1	0	4,660	191	66	.4	0
March	8	158	20	9	34	[1] 33	16,400	2,210	1,380	163	1.2	714	93	44	.1	0	4,490	332	67	1.0	0
April	------	136	16	8	36	[1] 32	7,350	1,070	732	65	0	641	85	43	.1	0	3,700	264	61	.5	0
May	15	115	16	7	35	[1] 32	6,500	750	450	21	0	600	70	36	.3	0	3,160	260	100	.6	0
June	22	224	17	8	41	[1] 36	14,500	1,500	900	28	0	2,300	300	170	3.2	0	4,930	380	120	.5	0
Average	15	147	18	8	35	[1] 32	9,910	1,270	778	73	.5	1,350	263	163	7.8	0	3,490	344	79	1.5	0
Maximum	28	290	26	13	44	[1] 46	32,100	3,240	1,970	181	2.9	3,650	652	505	27.0	.2	6,200	700	170	4.6	.1
Minimum	5	15	5	4	29	[1] 19	1,840	365	226	14	0	918	70	36	.1	0	798	88	45	.1	0

[1] Filtered.

TABLE No. 22.—*Summary of monthly average operation and laboratory results reported from each individual Ohio River plant included in the survey of 1923–24*—Continued

CINCINNATI, OHIO, FILTRATION PLANT

Month	Operation data															
	Average daily volume of water treated	Filter operation				Coagulants (grains per gallon)									Chlorine	Average river stage
		Average length run	Washing			Alum			Iron sulphate			Lime or soda				
			Per cent wash water	Average time	Rate inches (per minute)	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum		
	1,000 gals.	*Hours*		*Minutes*											*P. p. m.*	*Feet*
July	54,000	45.5		4.5	16.5				1.2	1.6	0.9	0.7	0.8	0.5	0.15	12.1
August	54,057	38.5	0.9	4.5	16.5				1.4	2.0	1.1	.6	.9	.6	.15	13.4
September	52,550	19.7	2.6	4.5	16.5				1.2	1.6	1.0	.6	.8	.5	.20	11.9
October	52,008	12.2	3.1	4.5	16.5				1.1	1.7	.8	.5	.8	.5	.25	9.8
November	47,323	22.3	1.7	4.5	16.5				1.1	1.6	.8	.6	.8	.5	.23	11.9
December	46,065	30.9	1.2	4.5	16.5				1.4	1.7	1.2	.7	.8	.6	.19	29.2
January	49,308	22.9	1.6	4.5	16.5				2.0	2.5	1.7	.8	1.1	.8	.18	39.3
February	48,032	23.2	1.5	4.5	16.5				1.7	2.2	1.6	.7	1.0	.6	.19	23.0
March	46,298	23.6	1.5	4.5	16.5				1.6	2.0	1.6	.7	1.0	.8		25.3
April	47,975	31.3	1.1	4.5	16.5				1.5	2.0	1.3	.7	.9	.7	.19	29.3
May	46,649	36.7	1.0	4.5	16.5				1.3	1.8	1.1	.8	.9	.6	.21	30.3
June	50,461	29.3	1.2	4.5	16.5				1.6	1.9	1.4	.6	.9	.7	.23	21.7
Average	49,569	28.0	1.6	4.5	16.5				1.4	1.9	1.2	.6	.9	.6	.20	21.4
Maximum	54,057	45.5	2.6	4.5	16.5				2.0	2.5	1.7	.8	1.1	.8	.25	39.3
Minimum	46,065	12.2	.9	4.5	16.5				1.1	1.6	.8	.5	.8	.5	.15	9.8

Mouth	Laboratory data																				
	Water temperature	Turbidity			Alkalinity		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
		Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
	° C.																				
July		365	90	19	38	43	4, 830	735	75	2.6	95.0	1, 540	400	80	3.2	55.0	2, 480	326	62		
August		610	160	25	37	41	8, 970	1, 550	180	8.0	135.0	3, 750	850	170	8.9	140.0	9, 910	1, 600	129	6.8	2.0
September	24.0	95	39	16	46	48	1, 380	425	205	6.1	75.0	1, 350	405	280	19.0	355.0	680	211	104	2.3	1.3
October	18.0	37	15	15	54	55	455	170	95	12.0	4.4	150	90	60	8.1	3.7	173	106	13	1.2	.1
November	10.0	66	18	14	40	59	1, 300	410	225	38.0	2.4	275	67	21	3.3	.4	403	55	66	3.1	0
December	6.5	310	75	22	32	41	50, 600	6, 000	1, 120	145.0	1.7	865	145	39	2.7	.3	3, 845	446	85	4.1	.1
January	3.0	370	130	22	23	33	27, 600	5, 400	650	115.0	3.0	370	95	27	2.9	.4	2, 103	997	91	5.6	.1
February	2.0	240	70	18	27	36	28, 600	4, 700	1, 300	230.0	3.0	835	245	75	18.0	1.3	907	143	36	2.8	.1
March	3.8	245	70	20	29	35	70, 500	8, 450	1, 190	170.0	4.0	1, 250	210	65	10.0	3.0	8, 200	1, 229	79	2.6	.2
April	11.0	255	70	19	25	33	6, 600	1, 300	255	36.0	4.6	295	85	13	1.6	.7	670	199	96	1.3	.1
May	14.0	150	37	16	23	32	6, 000	670	135	12.0	2.0	270	55	13	.7	.4	3, 060	385	86	3.2	.3
June	21.0	375	80	17	40	44	12, 700	1, 170	135	4.0	41.0	1, 010	255	42	3.8	2.9	3, 300	1, 300	172	7.9	.1
Average	11.3	260	71	19	35	42	18, 300	2, 580	464	65.0	31.0	997	242	74	6.8	47.0	2, 980	575	85	3.4	.5
Maximum	24.0	610	160	25	54	59	70, 500	8, 450	1, 300	230.0	135.0	3, 750	850	280	19.0	355.0	9, 910	1, 600	172	7.9	2.0
Minimum	2.0	37	15	14	23	32	455	170	75	2.6	1.7	150	55	13	.7	.3	173	55	13	1.2	0

TABLE NO. 22.—*Summary of monthly average operation and laboratory results reported from each individual Ohio River plant included in the survey of 1923–24*—Continued

LOUISVILLE, KY., FILTRATION PLANT

Month	Operation data															
	Average daily volume of water treated	Filter operation				Coagulants (grains per gallon)									Chlorine	Average river stage
		Average length run	Washing			Alum			Iron sulphate			Lime or soda				
			Per cent wash water	Average time	Rate inches (per minute)	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum		
	1,000 gals.	*Hours*		*Minutes*											*P. p. m.*	*Feet*
September	36,699	7.6	....	1.6	22	0.9	2.0	0	....	....	....	....	....	....	0.42	8.9
October	37,101	9.4	....	1.6	22	.6	1.1	.5	....	....	....	....	....	....	.50	7.9
November	36,578	11.3	....	1.7	22	1.4	2.0	.6	....	....	....	....	....	....	.39	9.0
December	33,660	39.7	....	4.0	22	1.6	2.0	.9	....	....	....	....	....	....	.21	11.9
January	43,422	35.8	....	4.0	22	1.1	2.0	.7	....	....	....	....	....	....	.18	20.0
February	38,942	39.0	....	4.0	22	1.1	2.3	.6	....	....	....	....	....	....	.18	10.7
March	36,341	40.1	....	4.0	22	1.0	2.1	.4	....	....	....	....	....	....	.17	10.9
April	35,953	41.2	....	4.0	24	.6	.9	.5	....	....	....	....	....	....	.16	13.4
May	34,946	45.3	....	4.0	24	1.1	1.9	.4	....	....	....	....	....	....	.48	12.8
June	37,737	45.9	....	4.0	24	.8	1.7	0	....	....	....	....	....	....	.60	10.3
July	40,491	34.2	....	4.0	24	.1	.7	0	....	....	....	....	....	....	.73	10.0
August	44,527	5.6	....	1.3	24				....	....	....	....	....	....	.68	9.5
Average	38,033	29.6	....	3.2	23	1.0	1.7	.4	....	....	....	....	....	....	.39	11.3
Maximum	44,527	45.9	....	4.0	24	1.6	2.3	.9	....	....	....	....	....	....	.73	20.0
Minimum	33,660	5.6	....	1.3	22	.1	.7	0	....	....	....	....	....	....	.16	7.9

Month	Laboratory data																				
	Water temperature	Turbidity			Alkalinity		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
		Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
	° C.																				
September	22.0	95	85	36	64	54	2,340	3,200	3,610	5,670	24.0	1,160	-------	-------	-------	37.0	349	256.0	82	127	0.2
October	17.0	17	13	-------	67	-------	1,100	10,900	-------	3,930	13.0	735	-------	-------	-------	27.0	90	3.5	-------	1.6	0
November	10.0	30	12	-------	70	-------	6,440	10,300	-------	2,800	33.0	1,030	-------	-------	-------	8.3	177	427.0	-------	15.0	.3
December	9.0	440	225	31	53	40	21,700	11,300	1,620	343	10.0	2,470	-------	-------	-------	4.6	3,180	1,550.0	85	5.9	.1
January	4.3	425	330	50	42	25	25,800	19,000	2,100	805	13.0	1,810	-------	-------	-------	5.3	3,560	2,250.0	91	4.6	0
February	5.0	258	177	32	56	48	27,500	21,000	2,900	1,140	17.0	1,460	-------	-------	-------	3.3	4,660	993.0	44	8.4	0
March	5.4	375	210	32	55	41	22,800	11,800	2,110	600	8.0	1,440	-------	-------	-------	3.1	2,630	913.0	42	7.2	0
April	12.0	265	185	27	46	36	13,600	6,810	1,130	260	7.0	1,970	-------	-------	-------	1.7	1,230	1,020.0	100	3.3	0
May	15.0	165	67	29	46	41	9,010	4,340	1,660	153	3.0	2,200	-------	-------	-------	2.0	2,300	652.0	172	8.7	.3
June	22.0	370	163	44	67	51	12,200	4,730	1,530	125	4.0	3,670	-------	-------	-------	1.6	5,140	2,200.0	460	9.6	0
July	24.0	300	190	36	58	50	5,290	3,890	766	130	5.0	3,530	-------	-------	-------	5.2	3,110	3,300.0	265	8.2	.1
August	26.0	32	24	14	65	65	1,780	51,700	10,900	11,200	6.0	1,220	-------	-------	-------	5.7	183	43.0	11	1.2	0
Average	14.3	231	141	33	57	45	12,500	[6] 13,200	2,360	2,270	12.0	1,890	-------	-------	-------	8.7	2,220	1,140.0	135	6.0	.1
Maximum	26.0	440	330	50	70	65	25,800	51,700	10,900	11,200	33.0	3,670	-------	-------	-------	37.0	5,140	3,300.0	460	127	.3
Minimum	4.3	17	12	14	42	25	1,100	3,200	766	125	3.0	735	-------	-------	-------	1.6	90	3.6	11	1.2	0

[6] Excluding results for August, 1924, which was abnormal because of use of $CuSO_4$ instead of alum.

Table No. 22.—*Summary of monthly average operation and laboratory results reported from each individual Ohio River plant included in the survey of 1923–24*—Continued

EVANSVILLE (IND.) FILTRATION PLANT

Month	Operation data															
	Average daily volume of water treated	Filter operation				Coagulants (grains per gallon)									Chlorine	Average river stage
		Average length run	Washing			Alum			Iron sulphate			Lime or soda				
			Per cent wash water	Average time	Rate (inches per minute)	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum		
	1,000 gals.	Hours		Minutes											P. p. m.	Feet
July	9,530	24.0	2.7	83.5		1.0	2.3	0.5				0.3	0.9	0.1	0.42	10.1
August	9,038	24.0	2.7	76.6		1.2	2.2	.6				.3	.5	.1	.51	11.6
September	8,801	19.6	4.4	124.0		.9	1.2	.8				.4	.5	.1	.56	9.3
October	8,542	11.6	6.4	175.0		1.0	2.0	.7				.3	.3	.1	.56	8.2
November	8,086	9.8	7.5	181.0		1.0	1.7	.7				.3	.4	.2	.60	9.1
December	7,362	23.0	3.3	78.0		2.6	4.5	1.0				.8	1.5	.3	.45	24.8
January	8,074	24.0	3.2	83.0		2.4	3.4	1.4				.7	1.1	.5	.34	37.4
February	8,553	24.0	3.3	80.0		2.2	4.0	1.0				.5	1.0	.3	.35	21.0
March	7,569	23.0	3.5	84.5		1.9	6.8	.9				.4	1.0	.3	.39	20.9
April	7,436	24.0	3.4	74.8		1.8	6.8	.7				.3	.5	.1	.39	26.3
May	7,325	33.0	3.7	85.0		1.0	1.6	.2	2.3	4.9	1.6	.7	1.4	.1	.41	26.0
June	7,167	24.0	3.2	73.0		1.8	3.3	.7				.4	.5	.2	.47	19.6
Average	8,124	21.2	3.9	99.9		1.6	3.3	.8	2.3	4.9	1.6	.5	.8	.2	.45	18.7
Maximum	9,530	24.0	7.5	181.0		2.6	6.8	1.4	2.3	4.9	1.6	.8	1.4	.5	.60	37.4
Minimum	7,167	9.8	2.7	73.0		.9	1.2	.2	2.3	4.9	1.6	.3	.3	.1	.34	8.2

Month	Laboratory data																				
	Water temperature	Turbidity			Alkalinity		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
		Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primany settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
	° C.																				
July	27.0	122	......	23	63	63	2,060	......	433	......	4.2	2,580	......	1,030	......	8.5	2,540	......	95	......	0.4
August	28.0	185	......	24	53	51	3,540	......	572	......	7.5	5,740	......	1,560	......	9.0	4,860	......	100	......	.3
September	24.0	83	......	26	72	70	1,820	......	567	......	8.9	4,830	......	1,680	......	19.0	2,890	......	95	......	.4
October	18.0	31	......	18	74	69	722	......	305	......	5.8	2,160	......	1,010	......	8.2	1,270	......	86	......	0
November	10.0	37	......	18	77	73	3,370	......	527	......	4.4	3,820	......	337	......	7.5	2,250	......	73	......	.1
December	8.0	456	......	21	51	46	5,220	......	503	......	3.0	5,040	......	190	......	4.6	3,880	......	63	......	0
January	3.0	332	......	28	39	32	11,100	......	1,740	......	8.9	2,910	......	255	......	8.3	7,450	......	63	......	0
February	2.8	291	......	23	64	49	65,600	......	3,720	......	1.6	5,820	......	232	......	1.8	2,750	......	84	......	.1
March	7.0	372	......	26	50	46	38,300	......	4,730	......	2.9	4,360	......	451	......	1.2	3,320	......	76	......	0
April	11.7	339	......	26	47	44	28,600	......	3.670	......	4.7	11,100	......	432	......	6.7	3,400	......	80	......	0
May	16.0	193	......	21	48	46	12,500	......	1,110	......	3.6	3,600	......	306	......	3.0	5,060	......	100	......	0
June	28.0	211	......	23	61	59	16,480	......	967	......	4.0	7,790	......	698	......	7.3	7,600	......	100	......	0
Average	15.0	221	......	23	61	54	15,800	......	1,570	......	4.5	4,980	......	682	......	7.1	3,940	......	85	......	.1
Maximum	28.0	456	......	26	77	73	65,600	......	4,730	......	8.9	11,100	......	1,680	......	19.0	7,600	......	100	......	.4
Minimum	3.8	31	......	18	39	32	722	......	305	......	1.6	2,160	......	190	......	1.2	1,270	......	63	......	0

TABLE NO. 22.—*Summary of monthly average operation and laboratory results reported from each individual Ohio River plant included in the survey of 1923–24*—Continued

HENDERSON (KY.) FILTRATION PLANT

Month	Operation data														
	Average daily volume of water treated	Filter operation				Coagulants (grains per gallon)									Chlorine	Average river stage
		Average length run	Washing			Alum			Iron sulphate			Lime or soda				
			Per cent wash water	Average time	Rate (inches per minute)	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum		
	1,000 gals.	*Hours*		*Minutes*											*P. p. m.*	*Feet*
July	2,310	48	--------	12	18	1.4	2.1	1.0	--------	--------	--------	--------	--------	--------	--------	--------
August	2,408	47	--------	12	18	1.7	3.0	1.0	--------	--------	--------	--------	--------	--------	0.20	11.3
September	2,226	47	--------	5	18	1.7	2.7	.6	--------	--------	--------	--------	--------	--------	.24	10.6
October	1,928	39	--------	4	18	1.0	1.9	.6	--------	--------	--------	--------	--------	--------	.24	10.4
November	1,839	35	--------	4	18	1.5	2.9	1.0	--------	--------	--------	--------	--------	--------	.25	10.8
December	1,985	42	--------	4	18	2.9	3.6	1.5	--------	--------	--------	--------	--------	--------	.21	24.7
January	2,410	41	--------	5	18	2.7	6.1	.8	--------	--------	--------	--------	--------	--------	.25	35.5
Average	2,158	43	--------	7	18	1.8	3.2	.9	--------	--------	--------	--------	--------	--------	.23	17.2
Maximum	2,410	48	--------	12	18	2.9	6.1	1.5	--------	--------	--------	--------	--------	--------	.25	35.5
Minimum	1,839	35	--------	4	18	1.0	1.9	.6	--------	--------	--------	--------	--------	--------	.20	10.4

Month	Laboratory data																				
	Water temperature	Turbidity			Alkalinity		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
		Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primany settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
	° C.																				
July		105		10	65	55						6,640			123	6.8	3,250			7.5	0.0
August	27.0	209		15	58	48						9,610		1,430	66	5.9	1,990		607	4.0	.3
September	25.0	96		11	71	55						3,360		683	46	5.1	2,220		838	5.6	.5
October	18.0	37		9	76	63						2,860		623	52	6.1	850		550	6.4	.8
November	10.0	45		9	68	57						3,330		640	35	6.1	1,270		790	4.1	.5
December	8.0	449		13	53	44						4,750		783	29	5.8	1,590		1,640	1.2	0
January	5.5	317		21	41	32						6,400		1,780	202	1.0	1,000		1,080	4.3	1.0
Average	16.0	180		13	62	51						5,287		990	79	5.3	1,736		917	4.7	.4
Maximum	27.0	449		21	76	63						9,610		1,780	202	6.8	3,250		1,640	7.5	1.0
Minimum	8.0	37		9	41	32						2,860		623	29	5.1	850		550	1.2	0

TABLE No. 23.—*Average and maxima of monthly mean laboratory results reported from each individual Ohio River plant during the period of the observations*

A. AVERAGES [1]

Plant	Water temperature, °C.	Turbidity, p. p. m.			Alkalinity, p. p. m.		Bacterial count, per c. c. (48 hours, 20° C.)					Bacterial count, per c. c. (24 hours, 37° C.)					B. coli index, per 100 c. c.					Period
		Raw	Settled	Applied	Raw	Applied	Raw	Settled	Applied	Filtered	Chlorinated	Raw	Settled	Applied	Filtered	Chlorinated	Raw	Settled	Applied	Filtered	Chlorinated	
East Liverpool	12	168	......	12	16	19	......	......	......	......	......	4, 420	......	724	180	19. 4	2, 680	......	986	2. 2	0. 4	July, 1923-June, 1924.
Steubenville	15	51	27	10	7	19	1, 650	1, 580	379	248	79. 0	763	390	80	39	2. 1	333	160	55	. 6	. 2	Do.
Huntington	......	204	......	16	28	31	......	......	......	......	......	1, 590	......	493	16	1. 6	2, 370	......	......	48. 0	. 8	Do.
Ashland	13	392	......	14	27	20	......	......	......	......	......	1, 040	......	115	11	. 9	11, 500	......	1, 430	3. 5	. 9	Do.
Ironton	13	237	37	15	29	23	19, 600	1, 790	476	28	4. 0	4, 190	477	121	5	1. 3	14, 900	1, 460	162	1. 6	. 1	Do.
Portsmouth	15	147	18	8	35	32	9, 910	1, 270	778	73	. 5	1, 350	263	163	8	. 2	3, 490	344	79	1. 7	. 1	Do.
Cincinnati	11	260	71	19	35	42	18, 300	2, 580	464	65	31. 0	997	242	74	7	[3] 47. 0	2, 980	575	85	3. 4	. 4	Do.
Louisville	14	231	141	33	57	45	12, 500	[2] 13, 200	[2] 2, 360	[2] 2, 270	12. 0	1, 890	......	......	......	8. 7	2, 220	1, 140	135	17. 0	. 1	September, 1923-August, 1924.
Evansville	15	221	......	23	61	54	15, 800	......	1, 570	......	4. 0	4, 980	......	682	......	7. 1	3, 940	......	85	......	. 1	July, 1923-June, 1924.
Henderson	16	180	......	13	62	51	......	......	......	......	......	5, 290	......	990	79	8. 1	1, 736	......	786	4. 7	. 4	July, 1923-January, 1924.

[1] Period of observations 1 year, except for Henderson plant, which was 7 months.
[2] Affected by secondary growths in clear-water reservoir during summer.
[3] Abnormally high because of the influence of excessive counts obtained during two periods when $CuSO_4$ was used instead of alum.

B. MAXIMA[1]

Plant	Water temperature, °C.	Turbidity p. p. m.			Alkalinity, p. p. m.		Bacterial count, per c. c. (48 hours, 20° C.)					Bacterial count, per c. c. (24 hours, 37° C.)					B. coli index, per 100 c. c.				
		Raw	Settled	Applied	Raw	Applied	Raw	Settled	Applied	Filtered	Chlorinated	Raw	Settled	Applied	Filtered	Chlorinated	Raw	Settled	Applied	Filtered	Chlorinated
East Liverpool	26	414	......	22	19	23	......	......	......	......	......	8,760	......	1,590	586	85.0	11,600	......	3,590	3.9	1.9
Steubenville	27	106	56	17	12	24	2,400	3,100	1,000	740	218.0	1,690	1,400	284	127	9.0	1,010	523	153	2.4	.8
Huntington	......	408	......	21	43	46	......	......	......	......	......	3,450	......	964	31	3.0	5,280	......	......	96.0	1.6
Ashland	25	895	......	22	43	48	......	......	......	......	......	1,490	......	215	63	3.0	41,700	......	5,500	10.0	.3
Ironton	13	237	37	15	29	23	46,600	3,600	1,020	100	5.8	10,000	1,620	342	20	3.3	23,900	1,460	162	1.6	.1
Portsmouth	28	290	26	13	44	46	32,100	3,240	1,970	181	3.0	3,650	652	505	27	.2	6,200	700	170	5.6	.3
Cincinnati	24	610	160	25	54	59	70,500	8,450	1,300	230	135.0	3,750	850	280	19	355.0	9,910	1,600	172	7.9	2.0
Louisville	26	440	330	50	70	65	25,800	[2]51,700	[2]10,900	[2]11,200	33.0	3,670	......	......	......	37.0	5,140	3,360	460	133.0	.3
Evansville	28	456	......	26	77	73	65,600	......	4,730	......	9.0	11,100	......	1,680	......	19.0	7,600	......	100	......	.4
Henderson	27	449	......	21	76	63	......	......	......	......	......	9,610	......	1,780	202	21.0	3,250	......	1,640	7.5	1.0

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[1] Period of observations 1 year, except for Henderson plant, which was 7 months.

[2] Abnormally high figure, obtained during August, 1924, when $CuSO_4$ was used instead of alum.

TABLE No. 24.—*Averages of monthly mean laboratory results reported from each individual Ohio River plant during the two periods, May to October and November to April, respectively*

SUMMER PERIOD (MAY-OCTOBER)

Plant	Water temperature C.	Turbidity			Alkalinity		Bacterial count, per cubic centimeter—agar, 48 hours, 20° C.					Bacterial count, per cubic centimeter—agar, 24 hours, 37° C.					B. coli index, per 100 c. c.				
		Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered unchlorinated	Filtered chlorinated	Raw	Primary settled	Applied to filters	Filtered unchlorinated	Filtered chlorinated	Raw	Primary settled	Applied to filters	Filtered unchlorinated	Filtered chlorinated
East Liverpool	22	82	-------	9.7	17.0	20	-------	-------	-------	-------	-------	5,680	-------	1,040	311.0	22.0	2,330	-------	647	2.3	0.6
Steubenville	-------	37	17	7.7	6.3	20	-------	-------	392	339.0	-------	875	479	88	73.0	2.2	458	-------	-------	.6	.1
Huntington	-------	198	-------	16.0	34.0	35	-------	-------	-------	-------	-------	1,690	-------	513	17.0	1.6	1,840	-------	-------	58.0	.2
Ashland	-------	469	-------	15.0	29.0	27	-------	-------	-------	-------	-------	975	-------	113	17.0	.7	14,400	-------	2,460	3.9	.2
Ironton	-------	220	37	15.0	32.0	25	10,000	932	241	11.0	2.9	6,050	722	169	8.8	2.0	14,300	1,560	163	2.3	.1
Portsmouth	-------	137	16	7.8	37.0	33	5,740	739	479	28.0	.1	1,880	356	251	15.0	0	3,330	398	100	2.7	.3
Cincinnati	-------	272	70	18.0	40.0	44	5,720	787	138	7.3	59.0	1,350	343	108	7.3	93.0	3,270	655	95	4.3	.8
Louisville	-------	163	90	32.0	61.0	52	5,290	13,100	3,690	3,530.0	9.2	2,080	-------	-------	-------	13.0	1,860	1,080	198	27.0	.1
Evansville	-------	138	-------	23.0	67.0	60	6,590	-------	659	-------	5.7	4,450	-------	1,050	-------	9.2	4,040	-------	96	-------	.2
Henderson	-------	112	-------	11.0	68.0	55	-------	-------	-------	-------	-------	5,620	-------	912	72.0	6.2	2,070	-------	665	5.9	.4

WINTER PERIOD (NOVEMBER-APRIL)

Plant	Water temperature C.	Turbidity			Alkalinity		Bacterial count, per cubic centimeter—agar, 48 hours, 20° C.					Bacterial count, per cubic centimeter—agar, 24 hours, 37° C.					B. coli index, per 100 c. c.				
		Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered unchlorinated	Filtered chlorinated	Raw	Primary settled	Applied to filters	Filtered unchlorinated	Filtered chlorinated	Raw	Primary settled	Applied to filters	Filtered unchlorinated	Filtered chlorinated
East Liverpool	-------	254	-------	14.0	14.0	19	-------	-------	-------	-------	-------	3,170	-------	410	51.0	17.0	3,040	-------	1,380	2.2	0.4
Steubenville	-------	65	38	12.0	7.5	17	-------	-------	366	156	-------	650	300	73	5.0	2.0	208	-------	-------	.6	.4
Huntington	-------	210	-------	16.0	23.0	27	-------	-------	-------	-------	-------	1,490	-------	474	15.0	1.5	2,890	-------	-------	39.0	1.4
Ashland	-------	315	-------	16.0	25.0	19	-------	-------	-------	-------	-------	1,110	-------	117	4.4	1.0	8,560	-------	398	3.1	0
Ironton	-------	254	37	15.0	26.0	20	29,200	2,640	712	45	4.6	2,330	233	73	1.4	.6	13,000	1,110	134	.9	.1
Portsmouth	-------	156	21	9.2	33.0	30	14,100	1,800	1,080	119	.9	814	170	76	.7	0	3,66[illegible]	292	60	1.2	0
Cincinnati	-------	248	72	19.0	31.0	40	30,900	4,380	790	122	3.1	648	141	40	6.4	1.0	2,690	511	76	3.3	.1
Louisville	-------	296	190	34.0	54.0	38	19,600	13,400	1,970	991	15.0	1,700	-------	-------	-------	4.4	2,560	1,190	72	7.4	.1
Evansville	-------	305	-------	23.0	55.0	48	25,400	-------	2,480	-------	3.3	5,510	-------	316	-------	5.0	3,840	-------	73	-------	0
Henderson	-------	270	-------	14.0	54.0	44	-------	-------	-------	-------	-------	4,850	-------	1,070	89.0	11.0	1,290	-------	1,170	3.2	.5

Explanation of Terms.

In the foregoing tables the term "primary settled" water refers to the effluent from the first stage of preliminary sedimentation, being used only where two stages of sedimentation are employed. At Steubenville, Cincinnati, and Louisville the primary settled effluent represents water which has undergone a stage of plain sedimentation and, at Ironton and Portsmouth, sedimentation aided by coagulation. The term "applied to filters" refers in all cases to the effluent water from the entire preliminary sedimentation process immediately prior to its passage to the filters, irrespective of whether one or two separate stages have been used. The term "filtered" refers in all cases to the unchlorinated filter effluent and the term "chlorinated," to the same effluent after its chlorination.[4]

In various parts of the ensuing text and tables, a number of additional terms will be used, most of which are self-explanatory. In this connection, however, it is desirable to explain the sense in which certain of them will be applied. The term "raw" water is employed in its usual sense, in that it refers to the untreated water as delivered to the plant. The term "influent" refers to the water delivered to a particular stage of treatment, as distinguished from the "effluent," or the water flowing from that stage. The terms "final effluent" or "plant effluent" signify the effluent flowing from the last stage of treatment, or, in other words, from the plant as a whole. The term "residual" signifies the amount or percentage of a given constituent remaining in the effluent from the plant or from a given stage of treatment, referred to its corresponding amount either in the raw water or in the influent water to a particular stage. Expressed in percentage terms, the "residual" is equal to 100 per cent minus the percentage of the constituent removed.

Expression of Laboratory Results.

The bacterial plate counts recorded in the tables are given in terms of both the 48-hour, 20° C., and the 24-hour, 37° C., count for 6 of the 10 plants. At the remaining four plants only the 37° C. count was reported regularly. In all cases the bacterial count at both temperatures was made on standard nutrient agar. The numbers of *B. coli* as given in the tables are expressed in terms of the ordinary *B. coli* index, computed according to the Phelps's method, as previously noted (p. 4).

Several years ago McCrady,[5] applying the theory of probability to the problem of enumerating *B. coli* from fermentation tests, first showed that the index computed in the foregoing manner fails to coincide with the most probable numbers of *B. coli* present in a given sample, though it may approximate it more closely when the index is based on a fairly long series of individual results. The method given by him for computing the most probable numbers of *B. coli* has not been widely used, owing to the mathematical complexities involved in its application. Several writers, including Stein,[6] Wolman,[7] and Wells,[8] have proposed simplified approximations of McCrady's method; Greenwood and Yule[9] have developed other formulae, based on the same theory as were those of McCrady, but simplified through the use of Poisson's series. In a report recently published, Reed[10] has developed from Greenwood and Yule's paper a set of working formulae which give the most probable numbers of *B. coli* from given combinations of fermentation tube test results. His calculations show that if a series of single-tube inoculations are made in dilutions of the water forming a progressive geometric series (i. e., 0.01, 0.1, and 1.0 cubic centimeters, etc.) the most probable number of *B. coli* is equal to approximately 2.31 times the index as determined by the Phelps method.[11] Where five 10-cubic centimeter tubes are inoculated, as in testing the conformance of a water to the United States Treasury Department standard, the most probable numbers of *B. coli* obtained by Reed are as follows, compared with the corresponding Phelps index numbers:

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[4] At all of the plants the only point at which the water is regularly chlorinated is after its passage through the filters.

[5] McCrady, M. H., "The Numerical Interpretation of Fermentation-Tube Results." Journal of Infectious Diseases, vol. 17, No. 1, July, 1915.

Number of tubes		B. coli per 100 c. c.	
(+)	(−)	B. coli index (Phelps)	Most probable number (Reed)
0	5	0	0
1	4	2.0	2.2
2	3	4.0	5.1
3	2	6.0	9.2
4	1	8.0	16.1
5	0	10.0	(1)

[1] Indeterminate.

The *B. coli* index figures as given in the base tables which have been presented may be converted readily to terms of the most probable numbers of *B. coli* by applying factors based on the equivalents above shown. For purposes of the present report, it has seemed desirable to adhere to the older and more common method of enumeration, though in a later section of this text a comparison will be made of results obtained by both methods, when applied to the same laboratory data. In the text which immediately follows, it is proposed to discuss briefly the average characteristics of the raw waters as delivered to the various Ohio River plants and of the effluents produced by them during the period of the observations.

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[6] Stein, M. P., "The Interpretation of *B. coli* Test Results on a Numerical and Comparative Basis." Journal of Bacteriology, vol. 4, No. 3, May, 1919.

[7] Wolman, A., and Weaver, H. L., "A Modification of the McCrady Method of the Numerical Interpretation of Fermentation-Tube Results." Journal of Infectious Diseases, vol. 24, No. 3, May, 1919.

[8] Wells, P. V., and W. F., "A Standard Bacterial Index." Jour. Amer. Water Works Assoc., vol. 9, No. 3, May, 1922. (Also Wells, W. F., Am. Jour. Pub. Hlth., vol. 9, Nos. 9 and 12.)

[9] Greenwood, J., jr., and Yule, G. U., "On the Statistical Interpretation of Some Bacteriological Methods Employed in Water Analysis." Jour. of Hygiene, vol. 16, No. 1, July, 1917.

[10] Report of Advisory Committee on Drinking Water Standards, Appendix III, "*B. coli* Densities as Determined from Various Types of Sample." Lowell J. Reed, Public Health Reports, Apr. 10, 1925, pp. 704–716. (Reprint No. 1029.)

[11] Provided that no anomalous, or "skip," results are obtained in the various dilutions.

Raw Water Characteristics.

In Tables Nos. 22, 23, and 24 have been given, in terms of monthly averages, figures indicating the character of raw water delivered to these plants from month to month and, in the tables presented in Appendix B, similar figures showing the day-to-day variation in these characteristics. In order to bring together for more ready comparison the monthly average raw water data shown in Tables Nos. 22–24, Tables Nos. 25 to 27, inclusive, have been prepared, giving in separate tabulations the turbidity, alkalinity, bacterial count at 20° C. and 37° C., and the *B. coli* index as observed in the several raw water supplies. At the foot of each column and collected in Table No. 28 are shown the average, maximum, and minimum of the monthly means for the period of the observations. (See also fig. 22.)

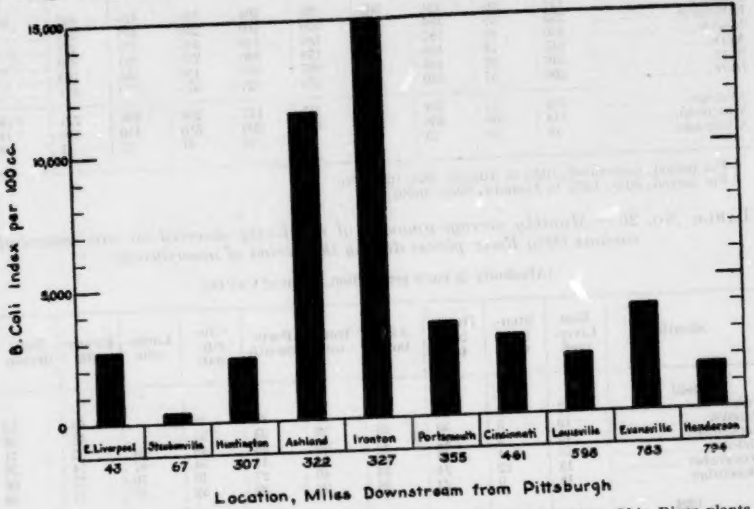

FIG. 22.—Average numbers of *B. coli* observed in the raw waters of the various Ohio River plants during the period of observations. (Plot of data given in Table No. 27)

TABLE No. 25.—*Monthly average amounts of turbidity observed in the raw water at various Ohio River plants during the period of observations*

[Turbidity in parts per million, silica standard]

Month	East Liverpool	Steubenville	Huntington	Ashland	Ironton	Portsmouth	Cincinnati	Louisville	Evansville	Henderson
1923										
July	22	22	224	432	280	159	365	-------	122	105
August	19	12	408	459	426	290	610	-------	185	209
September	19	10	59	606	66	21	95	95	83	96
October	16	13	23	27	22	15	37	17	31	37
November	31	13	68	93	94	59	68	30	37	45
December	332	85	322	510	404	220	319	440	456	449
1924										
January	414	106	334	500	350	203	370	425	332	317
February	252	49	184	272	300	160	240	258	291	-------
March	350	61	187	252	180	158	245	375	372	-------
April	147	74	168	260	194	136	255	265	339	-------
May	216	97	166	393	197	115	150	165	193	-------
June	200	67	310	895	330	224	375	370	211	-------
Average	168	51	204	392	237	147	260	[1] 231	221	[2] 180
Maximum	414	106	408	895	426	290	610	440	456	[2] 449
Minimum	16	10	23	27	22	15	37	17	31	[2] 37

[1] For period, September, 1923, to August, 1924, inclusive.
[2] For period, July, 1923, to January, 1924, inclusive.

TABLE No. 26.—*Monthly average amounts of alkalinity observed in raw waters at various Ohio River plants during the period of observations*

[Alkalinity in parts per million, terms of $CaCO_3$]

Month	East Liverpool	Steubenville	Huntington	Ashland	Ironton	Portsmouth	Cincinnati	Louisville	Evansville	Henderson
1923										
July	17	6	31	15	30	32	38	-------	63	65
August	19	5	30	23	26	33	37	-------	53	58
September	16	5	42	43	40	38	46	64	72	71
October	15	4	43	40	40	44	54	67	74	76
November	13	12	34	34	40	37	49	70	77	68
December	18	9	22	25	24	29	32	53	51	53
1924										
January	12	5	12	19	20	31	23	42	39	41
February	12	6	17	25	23	33	27	56	64	-------
March	16	6	27	21	25	34	29	55	50	-------
April	15	7	27	23	24	36	25	46	47	-------
May	17	9	24	24	23	35	23	46	48	-------
June	19	9	32	29	32	41	40	67	61	-------
Average	16	7	28	27	29	35	35	[1] 57	61	[2] 62
Maximum	19	12	43	43	40	44	54	70	77	[2] 76
Minimum	12	4	12	15	20	29	23	42	39	[2] 41

[1] For period, September, 1923, to August, 1924, inclusive.
[2] For period, July, 1923, to January, 1924, inclusive.

Table No. 27.—*Monthly average numbers of bacteria observed in raw water at various Ohio River plants during the period of observations. A.—Plate counts on standard agar per cubic centimeter. B.—B. coli index per 100 cubic centimeters*

(Counts on standard agar)

Months	48-hour count, 20° C.						24-hour count, 37° C.									
	Steubenville	Ironton	Portsmouth	Cincinnati	Louisville	Evansville	East Liverpool	Steubenville	Huntington	Ashland	Ironton	Portsmouth	Cincinnati	Louisville	Evansville	Henderson [1]
1923																
July	....	11,300	3,460	4,830	[2] 5,290	2,060	6,690	1,030	1,390	397	10,000	1,980	1,540	[2] 3,530	2,580	6,640
August	....	7,600	6,720	8,970	[2] 1,780	3,540	5,700	330	3,450	1,350	9,590	3,650	3,750	[2] 1,220	5,740	9,610
September	....	4,000	1,410	1,380	2,340	1,820	3,050	1,000	2,610	1,270	4,700	1,260	1,350	1,160	4,830	3,360
October	....	4,570	1,840	455	1,100	722	2,470	490	694	520	4,630	1,510	150	735	2,160	2,860
November	....	4,000	5,010	1,300	6,440	3,370	3,680	1,380	1,640	1,290	3,550	918	275	1,030	3,820	3,330
December	....	23,000	32,100	50,600	21,700	5,220	6,330	980	2,280	1,490	2,230	1,260	865	2,470	5,040	4,750
1924																
January	....	37,400	12,800	27,600	25,800	11,100	2,670	580	2,180	1,250	3,300	699	370	1,810	2,910	6,460
February [3]	656	35,700	10,800	28,600	27,500	65,600	1,500	128	1,190	1,030	1,420	650	835	1,460	5,820	....
March	1,450	46,600	16,400	70,500	22,800	38,300	2,030	280	938	731	1,470	714	1,250	1,440	4,360	....
April	1,470	28,600	7,350	6,600	13,600	28,600	2,830	550	722	856	2,010	641	295	1,970	11,100	....
May	2,400	22,200	6,500	6,000	9,010	12,500	7,400	720	1,450	920	2,640	600	270	2,200	3,600	....
June	2,300	10,700	14,500	12,700	12,200	16,480	8,760	1,690	551	1,390	4,760	2,300	1,010	3,670	7,790	....
Average	1,650	19,600	9,910	18,300	12,500	15,800	4,420	763	1,590	1,040	4,190	1,350	997	1,890	4,980	5,290
Maximum	2,400	46,600	32,100	70,500	25,800	65,600	8,760	1,690	3,450	1,490	10,000	3,650	3,750	3,670	11,100	9,610
Minimum	656	4,000	1,410	455	1,100	722	1,500	128	551	397	1,420	600	150	735	2,160	2,860

[1] Henderson discontinued Jan. 31, 1924.

[2] Figures are for 1924.

[3] Began Feb. 20, 1924.

Table No. 27.—*Monthly average numbers of bacteria observed in raw water at various Ohio River plants during the period of observations. A.—Plate counts on standard agar per cubic centimeter. B.—B. coli index per 100 cubic centimeters*—Continued

(B. coli index per 100 c. c.)

Month	East Liverpool	Steuben-ville	Hunting-ton	Ashland	Ironton	Ports-mouth	Cincin-nati	Louis-ville	Evans-ville	Henderson [1]
1923										
July	28	526	1,000	1,000	[2] 1,000	6,200	2,480	[3] 3,110	2,540	3,250
August	140	58	1,000	6,520	23,900	3,900	9,910	[3] 183	4,860	1,990
September	18	782	964	10,400	19,100	1,000	680	347	2,890	2,220
October	224	49	499	10,900	17,100	798	173	90	1,270	850
November	1,400	57	964	6,320	13,500	2,500	403	177	2,250	1,270
December	3,890	754	3,900	3,410	15,700	5,060	3,845	3,180	3,880	1,590
1924										
January	3,290	214	5,280	4,220	13,100	1,520	2,103	3,560	7,450	1,000
February	1,660	94	2,330	2,690	13,000	4,660	907	4,660	2,750	----------
March	4,680	48	2,220	1,900	12,900	4,490	8,200	2,630	3,320	----------
April	3,300	83	2,640	32,800	9,930	3,700	670	1,230	3,400	----------
May	11,600	324	3,320	16,000	12,100	3,160	3,060	2,300	5,060	----------
June	1,950	1,010	4,280	41,700	13,800	4,930	3,300	5,140	7,600	----------
Average	2,680	333	2,370	11,500	14,900	3,490	2,980	2,220	3,940	1,740
Maximum	11,600	1,010	5,280	41,700	23,900	6,200	9,910	5,140	7,600	3,250
Minimum	18	48	499	1,000	9,930	798	173	90	1,270	850

[1] Discontinued after January, 1924.

[2] Omitted from average.

[3] Figures are for 1924.

From the data shown in these tables, the following indications concerning the character of the various raw waters may be noted:

1. As would be expected, in view of the irregular character of the Ohio River water, a wide range of variation is shown in the quality of the different raw waters.

2. Both the alkalinity and the turbidity of the river water are shown to be decidedly lower in the extreme upper stretches of the Ohio than in those farther downstream.

3. The highest degree of bacterial pollution of the river in the zones in which the several water intakes are located is shown to exist in the Ashland-Ironton zone, where both the bacterial count and the *B. coli* index are markedly higher than at any other point covered by the observations.

4. The lowest bacterial pollution is shown at Steubenville, a strikingly wide difference existing between the bacterial content of the river at this point and at the East Liverpool intake, about 25 miles upstream.

5. Excepting at Steubenville, the average *B. coli* index of all of the raw waters is shown to exceed by a wide margin the limit of 500 per 100 cubic centimeters prescribed in the International Joint Commission standard for raw water supplies taken from the Great Lakes.

The ranges of bacterial pollution in various zones of the Ohio River are determined by the factors of direct sewage pollution, tributary inflow and natural purification which have been discussed fully in a previous report[12] dealing with a laboratory survey of the river in 1914–1916. These factors are so complex in their interrelations that it is hardly desirable to undertake a discussion of them in this report, which is concerned primarily with another phase of the problem. It is sufficient to note here that the water intakes of all of the Ohio River cities included in this study are located well above local sources of pollution from the cities which they serve and deliver water of as good quality as is available in the zones of the river which are accessible. It also may be noted that, as far as is indicated by the results of the observations at the Portsmouth, Cincinnati, Louisville, and Evansville intakes, the raw water supplies in the section of the river below Portsmouth are roughly of similar quality.

Average Character of Effluents.

The character of effluents produced by the several Ohio River plants is shown in detail in the tables which have been presented in Appendix A. In Table No. 28 an idea can be gained of the average quality of the various effluents obtained at successive stages of purification in comparison with the average character of raw water delivered to each plant during the period of study. As noted in the table, these figures represent in each case the averages of the monthly means for the entire period. In order to furnish an index of the composite character of the effluents produced by the entire group of Ohio River plants, the period means for each plant given in Table No. 23 have been averaged and tabulated as in Table No. 28. In this table also are shown the highest and lowest of the period means given in Table No. 23, indicating the extreme ranges of variation in the yearly average quality of effluents produced by the different plants.

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[12] Public Health Bulletin No. 143, A Study of the Pollution and Natural Purification of the Ohio River, Part II. Report on Surveys and Laboratory Studies (especially pp. 68–76 and 324–335).

TABLE No. 28.—*Combined average and highest and lowest of mean turbidities and bacterial counts in raw waters and effluents of ten Ohio River plants during period of observations, with corresponding residual percentages in effluents derived from averages, as referred both to raw water and to influent water of each respective stage of treatment*

Stage of purification	Temperature °C.	Turbidity, p. p. m.	Alkalinity, p. p. m.	Bacteria per c. c., 48 hours, 20 °C.	Barteria per c. c., 24 hours, 37 °C.	B. coli index per 100 c. c.	Per cent of raw: Turbidity	Per cent of raw: 48-hour count, 20 °C.	Per cent of raw: 24-hour count, 37 °C.	Per cent of raw: B. coli	Per cent of influent: Turbidity	Per cent of influent: 48-hour count, 20 °C.	Per cent of influent: 24-hour count, 37 °C.	Per cent of influent: B. coli.
Raw:														
Average	14	209	36	13,000.0	2,650.0	4,620.0								
Highest	16	392	62	19,600.0	5,290.0	14,900.0								
Lowest	12	51	7	1,650.0	763.0	333.0								
Primary settled:														
Average		74		[1] 1,800.0	343.0	536.0	35.4	13.8	12.9	11.6	35.4	13.8	12.9	11.6
Highest		141		[1] 1,270.0	477.0	1,460.0								
Lowest		18		[1] 2,580.0	242.0	160.0								
Applied to filters:														
Average		16	34	[1] 733.0	344.0	423.0	7.7	5.6	13.0	9.2	21.6	40.7	+100.0	80.8
Highest		33	54	[1] 1,570.0	990.0	1,430.0								
Lowest		8	19	[1] 379.0	74.0	55.0								
Filter effluent unchlorinated:														
Average				[1] 103.0	43.0	[2] 2.6		.79	1.6	.50		14.0	12.5	.61
Highest				[1] 248.0	180.0	48.0								
Lowest				[1] 28.0	5.0	.6								
Filter effluent chlorinated:														
Average				22.0	[3] 5.5	.4		.17	.21	.09		21.4	12.8	15.4
Highest				79.0	47.0	2.0								
Lowest				.5	.2	.1								

[1] Excluding abnormally high figures for Louisville plant (see Table No. 27).

[2] Excluding abnormally high figures for Huntington and Louisville plants (see Table No. 27).

[3] Excluding abnormally high figures for Cincinnati plant (see Table No. 27).

Referring to Table No. 28, the following points of particular significance may be noted:

1. The marked reduction in turbidity and bacteria effected by primary sedimentation.

2. The relatively low range of variation in the turbidity of the water as applied to the filters, averaging 16 parts per million and ranging from 8 to 33 parts per million.

3. The greater proportionate variation in the average bacterial content, as compared with the turbidity, of both raw water and effluents from successive stages of purification.

4. The mean *B. coli* content of the unchlorinated and chlorinated filter effluents, averaging, respectively, 2.6 and 0.4 per 100 cubic centimeters.

The comparatively low range of variation in the mean turbidity of water applied to the filters at the various plants is evidence of the success with which turbidity control is exercised over the preparatory treatment of the raw water for filtration. It is, of course, a well-established practice in operating plants of the Ohio River type to maintain the turbidity of the applied water within a narrow range, suitable to the satisfactory clarification of the water by the filters; this, in fact, is the chief measure of control commonly utilized in the operation of preparatory systems of water treatment. In contrast with the limiting turbidity figures are those for bacteria and *B. coli*, which show a much wider variation both in the raw water and in the effluents from successive stages of purification. In a few instances, the range in the bacterial variation is shown to be proportionately greater in the effluents than in the raw water, indicating that the control ordinarily exercised over the operation of water purification processes dealing with raw waters of extremely variable character, such as are found in polluted streams of the Ohio River type, is not of a nature such as to permit the production of effluents approaching, even remotely, the constancy in respect to bacterial quality that they have as regards measurable turbidity. This point has been brought out previously in the discussion of the 1916 results in Part I of this report.

The *B. coli* figures given in Table No. 23, together with those in Table No. 28, are of interest chiefly in providing an index of the ability of the Ohio River plants to produce effluents conforming to the United States Treasury Department *B. coli* standard,[13] which is the one most widely used in the United States as a criterion of sanitary quality for public drinking water supplies. According to the original standard, a water giving a positive test for *B. coli* in not more than one out of five 10 cubic centimeter portions (or in more than 20 per cent of a series of 10 c. c. portions), would conform to the standard. According to the revised standard, the following provisions should be met by the water in order to conform to it:

(1) Of all the standard (10 c.c.) portions examined in conformance with a prescribed procedure, not more than 10 per cent shall show the presence of organisms of the *B. coli* group.

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[13] The original *B. coli* standard, described in Reprint No. 232 from Public Health Reports, vol. 29, No. 45, Nov. 6, 1914, was adopted on Oct. 21, 1914, by the Treasury Department as a guide in determining the relative fitness of water supplies served to the public by the interstate carriers for drinking purposes. Although it was not intended as a standard governing the quality of municipal water supplies, it has been adopted by a number of States as an official criterion in this respect. The revised standard, recommended by an officially designated advisory committee, was adopted by the Treasury Department early in the year 1925 and is fully described in Public Health Reports, vol. 40, No. 15, Apr. 10, 1925. In the present report the former and the new standards will be hereafter referred to as the "original" and the "revised" standards, respectively.

(2) Occasionally three or more of the five equal (10 c. c.) portions constituting a single standard sample may show the presence of *B. coli*. This shall not be allowable if it occurs in more than—

(*a*) Five per cent of the standard samples when 20 or more samples have been examined.

(*b*) One standard sample when less than 20 samples have been examined.

Expressed in terms of the *B. coli* index, the limiting density of *B. coli* prescribed by the original standard was 2.0 per 100 cubic centimeters and by the revised standard, 1.0 per 100 cubic centimeters. It is noted in connection with the revised standard that in order to conform to it, a given water must meet both of the above requirements, (1) and (2).

Referring to Table No. 23, the *B. coli* figures for the various individual plants, based in all except two cases on the results of observations covering exactly one year, indicate that with the aid of chlorination all of the Ohio River plants studied were able to produce final effluents conforming both to the original standard and to provision (1) of the revised standard, when considered in terms of the average results obtained over periods approximating a year.[14] The figures show, however, that without the aid of chlorination none of the plants was able to produce effluents conforming to the revised standard during the year of observations and but three of the effluents meeting the original standard. On a basis of these findings it appears that under present conditions surrounding the operation of the Ohio River plants, they must rely to a large extent upon continuous and effective chlorination as a measure of reinforcing their already highly elaborated methods of preliminary sedimentation, coagulation, and filtration, in order to produce effluents satisfying the most widely accepted current standard of bacterial quality.

In considering the average quality of effluents produced by the Ohio River plants it is pertinent to note any differences which may be observable in the character of effluents delivered by the five plants of Group I, employing two stages of preliminary sedimentation, as compared with the plants of Group II, employing a single stage of sedimentation. In Table No. 29 the results obtained by averaging separately the yearly mean figures for the two respective groups of plants are tabulated for comparison. It is noted that although the average numbers of bacteria present in the two series of raw waters were approximately the same (except for the 37° count, which is lower for the plants of Group I), the bacterial quality of the effluents at successive stages of purification, beginning with the water applied to the filters, is shown to have been consistently better for the plants of Group I than for those of Group II. It thus is apparent that double-stage preliminary sedimentation produced effluents of better average quality, on the whole, than did single-stage sedimentation, with conditions of raw-water pollution approximately the same in both cases.

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[14] The extent to which the effluents of these plants conformed to provision (2) of the standard is shown in Table No. 53, to be presented later in this section of the report.

TABLE No. 29.—*Comparison of average quality of raw waters and effluents of Ohio River plants at which double-stage and single-stage preliminary sedimentation, respectively, are used*

[I = Plants having double-stage sedimentation. II = Plants having single-stage sedimentation]

	Turbidity		Alkalinity		Bacterial count per cubic centimeter (48 hours, 20° C.)		Bacterial count per cubic centimeter (24 hours, 37° C.)		B. coli index per 100 c. c.	
	I	II	I	II	I	II	I	II	I	II
Raw	185	232	33	39	12,400	[1] 15,800	1,840.0	3,460.0	4,780.0	4,450.0
Primary settled	59				1,800		343.0		736.0	
Applied to filters	17	16	32	35	524	[1] 1,570	109.0	601.0	103.0	697.0
Filtered—unchlorinated					104		15.0	72.0	[2] 2.0	[3] 3.5
Filtered—chlorinated					32	[1] 4	[4] 3.1	7.4	.2	.5

[1] Based on results for a single plant only (Evansville).
[2] Abnormally high figure for Huntington plant excluded from average.
[3] Abnormally high figure for Louisville plant excluded from average.
[4] Abnormally high figure for Cincinnati plant excluded from average.

Efficiency of Bacterial Removal.

The average efficiencies of bacterial removal accomplished by the several Ohio River plants are shown in Table No. 30, in which the percentages of "residual" bacteria, computed from the data in Table No. 23, are given at each successive stage of purification. In section A of the table, the percentages are referred to the raw-water count as being 100 per cent, and, in section B, to the count in the influent water flowing to each respective stage. The figures have been calculated in terms of residuals, or percentages remaining, rather than as percentages "removed," in order to permit a more ready comparison of significant differences in the smaller figures.[15]

Referring to section A of Table No. 30, a considerable amount of variation is shown as between the different plants in respect to the percentages of bacteria remaining in the water at given stages of purification. This is especially true of the percentages derived from the plate counts, indicating that part of the variation is due to the effects of secondary bacterial growths, which presumably do not effect the *B. coli* results materially but are known to influence the plate counts to a marked extent under conditions favorable to bacterial multiplications. That these divergences are also attributable in part to differences in the extent of preliminary treatment given the water is evidenced by the greater constancy of the residuals for the plants of Groups I and II, when considered separately. In section B of the same table, the bacterial efficiency of each stage of purification is shown, likewise, to vary considerably for the different plants, though, again, a greater constancy in the figures is noted when the figures are separated into two groups as above described.

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[15] For example, the two fold difference existing between a residual of 1 per cent and one of 2 per cent is more clearly indicated by these residual figures than by the corresponding percentages of removal, 99 and 98 per cent, respectively.

On comparing the corresponding percentage figures for the different plants as given in Table No. 30, it will be noted that the bacterial efficiencies observed at two of the plants—namely, at East Liverpool and Steubenville—were of a decidedly lower order of magnitude than at the other plants of the Ohio River group. A study of the operation figures (Table No. 22) and descriptive data (Appendix C) for the two plants failing to disclose any peculiarities of design or of operation which would account for their behavior in this respect, it appears reasonable to infer that it is due largely to the marked differences existing in the character of Ohio River water as delivered to these two plants, as compared with its composition at points farther downstream. These differences probably are a result of a complexity of conditions, both physical and chemical, resulting mainly from the discharge of large amounts of industrial wastes into the upper stretches of the Ohio through the Allegheny, Monongahela, and Beaver Rivers and from the Pittsburgh-Wheeling district. Whatever may be the cause of these conditions, they undoubtedly interfere with the satisfactory treatment of Ohio River water in the zone extending upstream from Steubenville, as is attested by the growing difficulties experienced in securing proper coagulation of this water at certain times, in maintaining the efficiency of filtration, and in chlorinating the water to a sufficient degree without the production of undesirable tastes and odors. Evidences of the effects of these conditions on the bacterial efficiency of separate stages of treatment at the two plants are afforded by the relatively high percentages of residual *B. coli* in their coagulated and chlorinated waters, as compared with corresponding percentages of this organism remaining in the effluents from the same stages at the other Ohio River plants.

TABLE No. 30.—*Percentages which average amounts of turbidity and of bacteria observed in the effluents from various stages of treatment were of the corresponding amounts observed in the raw water and in the influent water to each respective stage*

A. PERCENTAGE OF RAW WATER CONSTITUENT

[Based on yearly average figures in Table No. 27]

Plant	Turbidity		Bacterial count—48 hours, 20° C.				Bacterial count—24 hours, 37° C.				B. coli index			
	Settled	Applied	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated
East Liverpool		7.1						16.4	4.10	0.46		36.8	0.08	0.020
Steubenville	53.0	19.4	95.9	23.0	[1] 15.00	4.80	51.1	11.0	5.10	.28	48.0	16.5	.33	.100
Huntington		7.8						31.0	1.00	.10			2.00	.030
Ashland		3.8						11.2	1.10	.08		12.4	.03	.001
Ironton	15.6	6.3	9.2	2.4	.14	.02	11.4	2.9	.12	.03	9.8	1.1	.01	.001
Portsmouth	12.2	5.4	12.8	7.8	.76	.01	19.5	12.1	.58	.01	9.9	2.3	.05	.004
Cincinnati	27.3	7.3	14.1	2.5	.36	.17	24.3	7.4	.68	[2] 4.70	19.3	2.8	.11	.012
Louisville	61.1	14.3	[1] 100+	18.9	[1] 18.20	.08				.46	51.3	6.1	.77	.004
Evansville		10.4		9.9		.03		13.7		.14		2.2		.002
Henderson		7.2						18.6	1.50	.15		45.2	.27	.020
Mean	33.8	8.9	33.0	10.8	6.90	.72	26.6	13.8	1.80	.19	27.7	13.9	.41	.019

B. PERCENTAGE OF INFLUENT WATER CONSTITUENT

Plant	Turbidity		Bacterial count—48 hours, 20° C.				Bacterial count—24 hours, 37° C.				B. coli index			
	Settled	Applied	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated
East Liverpool		7.1						16.4	29.90	10.80		36.8	0.20	20.4
Steubenville	53.0	35.9	95.9	24.0	65.50	31.80	51.1	20.5	48.70	5.40	48.0	34.4	2.00	31.0
Huntington		7.8						31.0	3.30	10.00				1.6
Ashland		3.8						11.2	9.60	8.20		12.4	.20	2.6
Ironton	15.6	40.5	9.2	26.6	5.90	13.20	11.4	25.4	4.20	25.00	9.8	11.1	1.00	5.0
Portsmouth	12.2	44.5	12.8	61.2	9.40	.70	19.5	63.0	4.80	2.60	9.9	23.0	2.20	8.2
Cincinnati	27.3	26.8	14.1	18.0	14.00	47.70	24.3	30.6	9.20	[3] 100+	19.3	14.8	4.00	10.1
Louisville	61.1	23.4	[3] 100+	17.9	96.50	.50					51.3	11.8	12.60	.6
Evansville		10.4		9.9				13.7				2.2		
Henderson		7.2						18.6	8.00	10.20		45.2	.60	9.2
Mean, all plants	33.8	20.7	33.0	26.3	38.30	18.80	26.6	25.6	14.70	10.30	27.7	21.3	2.80	10.0
Mean [4]		34.2		29.5				34.9				19.0		
Mean [5]		7.3		9.9				18.2				24.2		

[1] Abnormally high; obviously due to aftergrowths and effects from substituting $CuSO_4$ for alum during two periods. Omitted from average.

[2] Abnormally high because of effect of secondary growths during summer season. Omitted from average.

[3] Excluded from average.

[4] Mean for plants using preliminary sedimentation (Steubenville, Ironton, Portsmouth, Cincinnati, and Louisville).

[5] Mean for plants not using preliminary sedimentation (East Liverpool, Huntington, Ashland, Evansville, and Henderson).

For the reasons above stated, the performance of the East Liverpool and Steubenville plants must be regarded, in some respects at least, as being abnormal in comparison with that of the other plants comprising the Ohio River group, though the results of the laboratory observations made at both plants have been included with those of the other plants in the statistical analysis of these data, in order to give due weight to the conditions encountered in the extreme upper portion of the Ohio River in casting up averages of performance by the entire group of plants taking their raw water supplies from this stream. The conditions in question, when considered in connection with the performance of the two plants, afford a significant indication of the possibilities which exist for a progressive deterioration in the efficiency of plants farther downstream should similar conditions become established in the river at these downstream points.

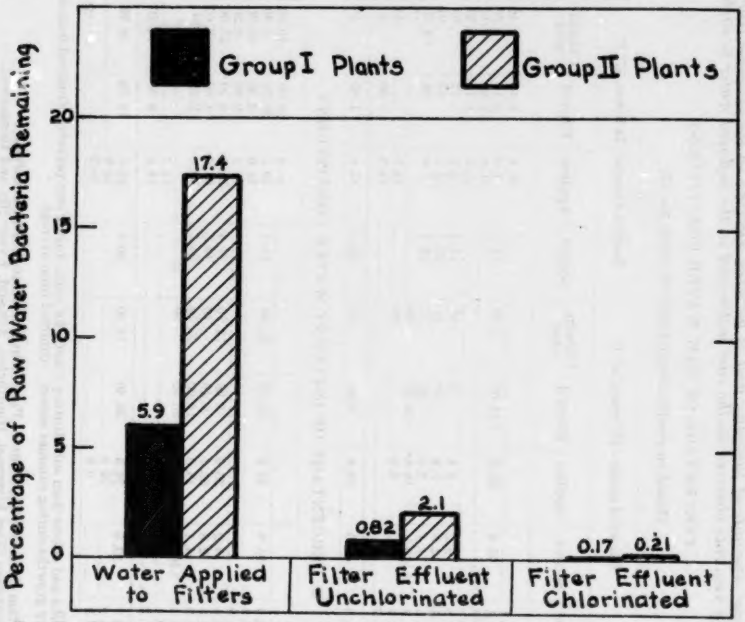

FIG. 23.—Comparative percentages of residual bacteria observed in the effluents from plants of Groups I and II, respectively, as based on averages covering the period of observations

In Table No. 31 are tabulated for comparison the averages of the residual percentages as given in Table No. 30 for plants of Groups I and II, respectively. The comparison thus given shows a higher bacterial efficiency for plants of Group I up to the final stage of treatment than for those of Group II, the advantage being most clearly marked in the effluent from the preliminary stages of purification. In Figure 23 is shown a graphical illustration of the figures in Table No. 31, based on the 37° C. count data. In this connection it is of interest to note that in Table No. 30 the Ironton and Portsmouth plants, where a coagulant was used at both stages of preliminary sedimentation, are shown to have given higher indicated efficiencies of bacterial removal than any other plants of the Ohio River group.

TABLE No. 31.—*Percentages of residual turbidity and bacteria observed in effluents from 10 Ohio River plants combined and from plants of Groups I and II, respectively*

A. PERCENTAGES AS REFERRED TO RAW WATER

[Based on average data given in Table No. 30]

Effluent	Turbidity			Bacterial count—24 hours, 37° C.			B. coli index		
	Combined	Group I	Group II	Combined	Group I	Group II	Combined	Group I	Group II
Applied to filters	7.7	9.2	6.9	13.00	5.90	17.40	9.200	2.200	15.700
Filtered—unchlorinated				1.60	.82	2.10	.056	.042	.079
Filtered—chlorinated				.21	.17	.21	.008	.004	.011

B. PERCENTAGES AS REFERRED TO INFLUENT WATER

Effluent	Turbidity			Bacterial count—24 hours, 37° C.			B. coli index		
	Combined	Group I	Group II	Combined	Group I	Group II	Combined	Group I	Group II
Applied to filters [1]	7.7	9.2	6.9	13.00	5.90	17.40	9.200	2.200	15.700
Filtered—unchlorinated				12.50	13.80	12.00	.610	1.900	.500
Filtered—chlorinated				12.30	20.70	10.30	15.400	10.000	14.300

[1] Referred to raw water.

In Table No. 32 have been tabulated for comparison the average percentages of residual turbidity and bacteria observed at the five Ohio River plants of Group I in 1924 and in parallel columns the corresponding mean percentages observed at two plants of the same group in 1916. Although these comparative figures indicate a decided and fairly consistent advantage in favor of the five Ohio River plants in 1924 as regards their efficiencies of bacterial removal, no wide divergencies in these figures are apparent except in the percentages of residual *B. coli* in the filtered and chlorinated waters. In these two instances, the percentages observed in 1924 were so much lower than the corresponding ones observed in 1916 as to suggest that some factor other than a moderate degree of improvement in bacterial efficiency may have been responsible for the discrepancy. Added weight is given to this suggestion by the fact that no similarly marked disparity is shown as between the corresponding percentages derived from the 20° C. and 37° C. bacterial counts.

TABLE No. 32.—*Comparison of percentages of raw water turbidity and bacteria remaining in effluents as observed: (a) At Cincinnati and Louisville plants in 1915–16, and (b) at Ohio River plants of Group I in 1923–24*

[Based on yearly average data]

Effluent	Turbidity		Bacterial count—48 hours, 20° C.		Bacterial count—24 hours, 37° C.		B. coli index	
	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
Primary settled	41.6	33.8	31.20	14.50	36.70	18.70	20.20	15.400
Applied to filters	6.3	9.2	6.10	4.20	8.00	5.40	5.40	2.200
Filtered—unchlorinated			[1] 1.20	.84	[1] .90	.82	[1] .86	.042
Filtered—chlorinated			.38	.26	.86	.17	.18	.004

[1] Derived from data from the Cincinnati plant alone, all other figures under (*a*) being based on combined data from the two plants.

In searching further for a possible cause of the discrepancy in the *B. coli* percentages, the ratios of the average numbers of *B. coli* to the corresponding numbers of bacteria growing at 20° C. and 37° C., respectively, as observed in the raw waters and effluents from successive stages of treatment both in 1916 and in 1924, were tabulated for comparison, as shown in Table No. 33, and illustrated graphically in the accompanying chart, Figure 24.

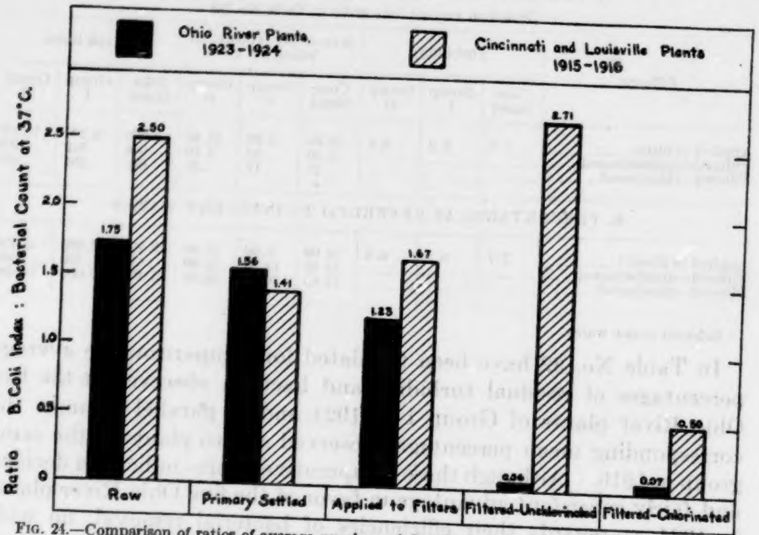

FIG. 24.—Comparison of ratios of average numbers of *B. coli* to corresponding average numbers of bacteria growing at 37° C., as observed at the 10 Ohio River plants in 1923-24, and at the Cincinnati and Louisville plants in 1915-16. (Plot of data given in Table No. 33)

TABLE NO. 33.—*Ratios of average numbers of B. coli to corresponding average numbers of bacteria growing at 20° C. and at 37° C., as observed at various stages of treatment: (a) At the 2 Ohio River plants studied in 1915-16, and (b) at the 10 Ohio River plants surveyed in 1923-24*

	Ratios			
	B. coli index to 20° count		B. coli index to 37° count	
	(a)	(b)	(a)	(b)
Raw water	0.51	0.36	2.50	1.75
Primary settled water	.46	.30	1.41	1.56
Water applied to filters	.45	.58	1.67	1.23
Filtered	[1] .33	.03	[1] 2.71	.06
Chlorinated	.22	.02	.50	.07

[1] Derived from averages for Cincinnati plant only, all other figures under (a) being based on combined data for the two plants.

On referring to this table it is noted that these ratios are fairly consistent with each other as observed in 1916 and in 1924 except in the filtered and chlorinated effluents, which gave much lower ratios in 1924 than in 1915. That this disparity was not due to any individual peculiarity of the two plants in question, in comparison with the other Ohio River plants, is evidenced by the fact that a similar discrepancy is shown in corresponding ratios derived from the data obtained from the same two plants in 1916 and in 1924, respectively, which are given in the following parallel tabulation similar in form to that of Table No. 33:

Ratios based on averages for Cincinnati and Louisville plants

	B. coli index to 20° C. count		B. coli index to 37° C. count	
	1916	1924	1916	1924
Raw water	0.51	0.17	2.50	1.800
Primary settled water [1]	.46	.22	1.41	2.380
Water applied to filters [1]	.45	.18	1.67	1.150
Filtered [1]	.33	.05	2.71	.480
Chlorinated	.22	.01	.50	.009

[1] Derived from averages for Cincinnati plant only.

Interpreted literally, the marked divergence of the ratios as observed in the filtered and chlorinated effluents, in contrast to their much closer agreement in the waters at stages prior to filtration, would appear to indicate that in 1924, the two stages of treatment, filtration, and chlorination, were much more selective in their action in respect to *B. coli* removal at all of the Ohio River plants, including those at Cincinnati and Louisville, than were these two particular stages at the two plants named under conditions as observed in 1916. No reasonable theory would appear to account for this inconsistency other than some abnormality in the average results obtained in 1924 from *B. coli* examinations of the filtered and chlorinated effluents, which would cause them to be abnormally low in comparison with corresponding averages observed in 1916.

A search for some factor which would cause these results to be abnormally low has revealed but one deviation in respect to the methods of determining *B. coli* which could account for the discrepancy indicated. On referring to Table No. 4 giving the results of weekly average *B. coli* determinations made at the Cincinnati and Louisville plants in 1916, it will be noted that in these 1916 observations, *B. coli* results were obtained, in all samples, including the filter effluents, from inoculations, into lactose broth, of single portions of the water varying in amounts according to a geometric series, thus: 0.001, 0.01, 0.1, 1, and 10 cubic centimeters. For samples of unchlorinated and chlorinated filter effluents, the portions usually inoculated were 0.1, 1, and 10 cubic centimeters, covering a range ordinarily sufficient to give a negative result in the smallest portion inoculated.

In the 1924 observations the same geometric system of dilutions as above described was used for samples of raw water and of effluents prior to filtration, but owing to the importance of determining the extent to which both the unchlorinated and chlorinated effluents from the Ohio River plants satisfied the requirements of the United States Treasury Department standard in respect to *B. coli* content, the foregoing procedure was varied in this instance to conform with that which is recommended in connection with the Treasury Department standard—namely, the inoculation of five 10-cubic centimeter portions of each sample of the effluent into the lactose broth medium.[16] This procedure obviously would have a tendency to give lower average *B. coli* index results than would the geometric series dilution method, when applied to effluents occasionally containing more than 10 *B. coli* per 100 cubic centimeters, which is the maximum index obtainable by inoculation of five 10-cubic centimeter portions of the sample. The foregoing data give every indication, therefore, that the average *B. coli* indices in both unchlorinated and chlorinated effluents, as observed at the various Ohio River plants in the 1923–24 survey, were lower than would have been the case had the geometric system of dilutions been employed in testing these effluents.

Relations between Bacterial Quality of Raw Water and that of Effluents.

In Part I of this report (see p. 32) it has been shown, from data collected in the preliminary study of the Cincinnati and Louisville plants made in 1915–16, that a well-defined relationship was found to exist between variations in the bacterial quality of the raw water and corresponding variations occurring in the quality of the effluents produced at different stages of purification. Owing to the importance of this relation in reference to the experimental determination of the safe limits of raw-water pollution which are consistent with the production of effluents having specified bacterial qualities, it has been considered as the principal objective of these studies to examine the data for further detailed evidences bearing on its existence and nature.

On referring to the tables in Appendix A, giving the results of daily bacteriological examinations of the several raw and effluent waters, numerous instances may be found in which a decided tendency is shown for the bacterial content of the effluents to vary more or less concurrently with that of the raw water. Most noticeable evidence of this tendency is found when relatively sudden and wide increases occur in the raw-water count, the effect of these "waves" being readily traceable through the effluents from successive stages of purification. The frequency with which this occurrence is observable precludes any possibility that it may be a chance phenomenon.

A similar though less sharply defined tendency toward concurrent variations is shown by the monthly averages derived from daily examinations of the several raw waters and the effluents produced from them. Thus it is noted in Table No. 22 that with few exceptions relatively higher or lower average amounts of turbidity and numbers of bacteria were observed in the effluents at the different plants during months in which the corresponding raw-water figures were higher or lower. These tendencies are in harmony with what was found in the preliminary observations of 1916, as is shown by an inspection of Figures 7 to 12, presented in Part I of this report.

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[16] It was intended originally in connection with the 1923–24 survey to carry out at each plant laboratory a series of parallel routine tests of all unchlorinated and chlorinated filter effluent samples, using the geometric system of broth inoculations in one series and the Treasury Department standard five-tube system in the other series. It was found impracticable to follow this program, because of the extra routine laboratory work which it would have imposed on the various collaborating plant operators.

A more satisfactory way of studying these correlations, as previously has been noted, consisted in grouping the results of the laboratory observations according to the amounts of turbidity, or the numbers of bacteria, appearing in the raw water, following the same method which was used in the analysis of data from the 1915–16 study and has been described in Part I of this report (see pp. 16–20). In the present instance, however, two slight variations of the method previously described were employed. One of these consisted in the use of daily rather than weekly average results for purposes of grouping, it having been found by trial that the effects of the "lag" in the relations between the quality of raw water and of the various effluents, which are due to the time required for changes in the character of the raw water to be communicated through the successive stages of treatment, have a tendency to become counterbalanced when a fairly long series of results of individual observations are grouped and averaged. A second modification, which consisted in making a primary classification of the data according to raw-water turbidity, was made for the purpose of ascertaining the extent to which the amount of turbidity present in the raw water influenced the bacterial relationships derived by grouping the results according to the numbers of bacteria in the raw water. In addition, a primary classification was made of the *B. coli* data from four plants (East Liverpool, Ironton, Portsmouth, and Cincinnati) according to two seasonal periods of six months each—namely, May to October, inclusive, representing the warmer season, and November to April, inclusive, representing the colder season.

The procedure actually followed is illustrated in Table No. 34 showing working tabulations of the data as made in grouping and averaging the daily 37° C. counts, observed at the East Liverpool plant, according to the procedure above described. It will be noted in this tabulation that the data were first of all divided into three groups, according to raw-water turbidities ranging, respectively, from zero to 100, from 101 to 500, and over 500. The material in each one of these groups then was reclassified according to the raw-water bacterial counts falling within the various ranges as shown. These ranges in raw-water count, it will be noted, were formed roughly according to a progressive geometric series, by doubling successively the upper limit of each range. In each particular instance, however, the ranges were selected in a manner such as to give, as nearly as practicable, an even distribution of the observations among the various groups as selected. The arrangement of the group limits in the form of a geometric series was found to satisfy this requirement more nearly than any other system of ranges, for reasons which will be explained in a later section of this text.

TABLE No. 34.—*Sample tabulation showing the method followed in grouping and averaging a portion of the daily laboratory results according to raw-water turbidity and bacterial content, respectively*

[24-hour agar counts, 37° C., East Liverpool filtration plant]

TURBIDITY=0-100

0-500 per cubic centimeter					501-1,000 per cubic centimeter					1,001-2,000 per cubic centimeter					2,001-3,000 per cubic centimeter					3,001-5,000 per cubic centimeter				
Turbidity	Raw	Applied	Filtered	Chlorinated	Turbidity	Raw	Applied	Filtered	Chlorinated	Turbidity	Raw	Applied	Filtered	Chlorinated	Turbidity	Raw	Applied	Filtered	Chlorinated	Turbidity	Raw	Applied	Filtered	Chlorinated
10	300	200	90	0	18	720	210	90	0	15	1,700	950	380	1	15	2,500	380	22	1	15	3,500	1,200	350	1
20	110	------	------	0	18	700	230	110	4	15	1,800	1,900	500	5	15	2,200	750	80	0	70	3,600	1,440	200	2
20	420	------	------	0	10	800	120	28	0	70	1,800	400	120	25	15	2,800	350	300	4	45	5,000	1,200	28	2
10	300	35	40	0	10	700	360	100	4	20	1,800	960	120	0	20	2,200	960	160	0	30	3,500	260	120	0
15	400	160	40	3	8	1,000	120	160	0	15	1,200	170	120	1	15	2,100	220	60	1	8	4,000	340	72	0
12	300	45	25	0	8	700	110	190	0	15	2,000	500	150	2	15	3,000	960	40	1	5	4,000	1,000	280	1
12	250	40	50	1	6	600	340	200	0	20	1,200	230	80	1	15	2,400	720	240	1	22	4,800	2,700	660	0
12	450	110	25	15	6	800	180	140	0	20	1,700	1,200	450	90	40	2,600	150	60	2	20	3,500	900	180	6
12	300	125	140	9	15	710	------	------	0	15	2,000	380	330	2	12	2,200	1,600	130	1	80	5,000	1,100	600	1
12	300	260	75	0	12	550	110	90	1	10	1,300	260	120	6	10	3,000	280	100	0	50	3,800	2,600	1,000	1
12	350	200	18	1	15	900	300	70	0	6	1,100	400	300	0	10	2,700	920	300	1	30	3,400	550	500	0
12	500	140	24	1	10	800	350	40	0	10	2,000	340	140	0	10	2,400	500	200	0	20	4,200	840	260	0
12	400	50	80	0	30	1,000	1,000	480	1	20	1,600	400	120	0	40	2,200	540	340	1	10	3,400	180	25	0
25	500	13	3	0	15	700	140	100	1	10	1,600	700	140	2	30	2,100	950	320	2	12	3,300	1,150	35	0
15	150	32	1	0	15	1,000	190	12	20	15	1,200	840	320	0	40	2,800	450	200	1	15	3,300	400	250	6
15	160	50	8	5	12	600	90	40	25	12	2,000	190	20	5	25	2,600	180	250	0	22	3,400	1,700	400	35
15	80	26	6	0	12	800	125	22	4	30	2,000	1,800	130	18	20	2,200	300	120	26	15	3,300	1,600	330	12
15	140	48	16	4	25	520	8	6	1	12	2,000	2,000	100	24	30	2,500	1,200	130	26	15	3,500	1,600	700	1
15	200	40	8	0	15	700	270	20	0	25	1,300	1,100	160	40	16	2,700	1,300	60	0	12	5,000	1,400	360	130
15	400	280	7	1	90	900	116	5	1	20	1,800	650	200	0	20	2,700	440	70	0	20	3,200	3,000	180	50
100	500	170	2	0	100	800	65	0	0	20	1,800	150	10	3	70	2,200	1,250	160	8	35	4,000	2,000	130	40
80	500	25	10	1	90	1,000	68	2	4	35	1,300	250	34	------	50	2,500	1,100	100	25	20	3,500	2,000	220	0
70	100	14	4	0	100	850	10	3	0	100	1,700	540	14	6	40	2,800	700	200	240	25	4,000	900	80	0
60	100	10	6	0	90	650	36	2	0	90	1,800	240	8	3	80	2,400	62	1	0	20	3,100	100	170	4
70	300	100	10	0	80	800	80	6	0	100	1,200	230	16	4	60	2,500	20	1	2	35	4,400	2,500	220	26
60	250	36	4	0	60	800	100	1	0	100	1,500	80	4	0	90	2,100	88	1	3	40	3,300	370	75	2
60	200	20	3	1	60	600	60	5	1	100	1,300	6	3	0	80	3,000	240	10	1	60	5,000	1,200	340	150
50	80	10	3	0	70	1,000	60	6	0	100	1,600	210	11	0	80	2,700	210	26	0	100	3,500	180	4	1
40	200	25	0	0	100	900	60	1	1	80	1,500	470	36	0	60	3,000	1,100	100	6	100	4,400	370	14	2
60	210	10	2	0	100	900	400	72	0	80	1,800	100	4	0	90	3,000	------	30	2	80	3,700	6	27	0
90	500	12	6	3	70	840	115	72	2	40	1,300	360	100	2	------	------	------	------	------	50	3,500	520	32	1
60	450	48	5	0	------	------	------	------	------	100	2,000	------	------	1	------	------	------	------	------	50	4,500	800	300	2
60	150	80	0	0	------	------	------	------	------	80	1,800	900	300	2	------	------	------	------	------	50	3,400	1,100	14	0
60	250	45	3	0	------	------	------	------	------	60	1,200	1,000	550	50	------	------	------	------	------	20	4,800	1,900	700	1
80	300	20	0	0	------	------	------	------	------	70	1,500	900	560	0	------	------	------	------	------	30	3,700	------	260	0
100	500	70	6	0	------	------	------	------	------	20	2,000	750	300	8	------	------	------	------	------	30	3,400	1,000	240	[1] 1,000
100	400	60	3	0	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	20	3,200	1,600	230	220

80	280	12	5	0																				
60	150	30	2	0																				
50	250	46	3	2																				
70	400	22	2	0																				
40	100	140	200	1																				
80	200	30	12	1																				
40	60	1,400	800	1																				
30	100	250	170	0																				
Total, 1,936	12,620	4,531	1,917	50	1,270	24,340	5,423	2,073	70	1,550	58,400	21,556	6,000	301	1,113	76,100	17,920	3,811	355	1,331	142,100	42,606	9,526	697
Mean, 43	280	105	45	1.1	41	785	181	69	2.3	43	1,620	616	171	8.6	37	2,540	618	127	12	36	3,840	1,180	257	20
TURBIDITY=101-500																								
500	500	50	1	2	125	650	225	7	2	250	1,800	80	5	3	275	3,000	530	48	3	300	5,000	700	67	3
250	350	70	2	1	125	700	96	4	0	400	2,000	75	0	0	125	2,500	520	56	1	250	3,500	180	10	2
150	100	65	0	1	150	800	110	5	1	150	1,100	140	0	0	400	2,500	160	1	0	160	5,000	400	6	0
200	100	250	0	3	120	900	80	4	0	125	1,500	100	4	1	500	2,300	360	30	0	400	3,500	110	4	2
150	250	65	3	1	450	600	48	0	0	125	1,100	120	1	3	300	2,300	400	12	5	250	4,000	70	5	0
120	160	24	4	2	150	800	280	12	2	190	1,800	230	4	1	200	2,500	290	5	1	300	5,000	500	7	4
200	400	52	2	0	225	1,000	62	0	0	190	1,800	520	30	2	125	3,000	160	6	0	200	4,000	250	8	1
160	500	210	65	0	125	660	60	2	0	150	1,500	220	2	0	200	2,500	260	4	0	400	4,500	180		0
					175	760	28	1	0	300	1,800	54	20	0	300	2,600	180	13	2	500	4,000	460	60	12
										400	1,100	32	5	0	150	2,200	250	18	0	400	3,800	360	50	0
										250	1,100	60	8	3	300	3,000	380	25	0	400	5,000	280	40	3
										175	1,500	330	2	2	150	3,000	640	24	8	200	4,800	230	80	3
										180	1,500	380	40	0	150	2,500	200	3	0	110	3,200	440	54	0
										150	1,500	130	3	0	170	2,300	150	26	0	140	3,300	360	34	5
										200	2,000	110	6	0	110	3,000	1,500	75	0	150	4,500			0
										250	2,000	280	14	2	200	3,000	460	15	0					
															110	2,800	800		380					
Total, 1,730	2,360	791	77	10	1,645	6,870	989	35	5	3,485	25,100	2,861	144	17	3,765	45,000	7,240	361	400	4,160	63,100	4,520	425	35
Mean, 216	295	99	9.6	1.3	183	763	110	3.9	0.56	218	1,570	179	9	1.1	221	2,650	426	23	24	277	4,210	323	33	2.3
TURBIDITY=OVER 500																								
										1,400	2,000	156	0	0	700	2,800	70	1	0	1,200	4,400	900	96	110
										800	1,500	12	0	0	850	2,900	180	0	0	900	3,500	160	28	0
										1,400	1,400	230	4	1	600	2,500	340	30	3	800	5,000	400	50	12
															800	3,000	100	3	1	800	5,000	140	1	5
															600	2,300	150	18	3	600	3,500	350	10	2
																				1,800	5,000	36	5	0
																				1,600	3,600	20	9	4
Total										3,600	4,900	398	4	1	3,550	13,500	840	52	7	7,700	35,000	2,006	190	133
Mean										1,200	1,630	133	1.3	0.33	710	2,700	168	10	1.4	1,100	5,000	287	27	19

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[1] Excluded from mean.

In averaging the results falling within the various groups an effort was made to exclude from the group totals all individual results clearly affected by secondary multiplications of bacteria occurring in basin and filter units during the warmer season. This procedure was followed because of the disturbing effect of these growths on the measurement of normal purification efficiencies and was justified by the evidence available that they ordinarily have little, if any, sanitary significance.[17] In excluding such results, the rule followed was to eliminate all results for a given effluent water exceeding by more than 20 per cent the corresponding result observed in the influent water at any preceding stage of treatment. This rule was followed as a result of a series of tests,[18] indicating that the expected error of a single plate count, based on duplicate platings of a sample, averages approximately 20 per cent. In the case at hand an indicated increase in the count not exceeding 20 per cent, in water passing a given stage of treatment, was allowed to stand as being attributable to errors of measurement, rather than to bacterial multiplication.

In Table No. 35 are tabulated the results obtained from grouping and averaging for each plant individually the 20° C. and 37° C. plate counts and *B. coli* indices, respectively, in accordance with the procedure previously described. On referring to this table it will be noted that in each one of the three turbidity ranges in which the average turbidity remains fairly constant as between the different bacterial groups a consistently well-defined relationship is shown between the bacterial content of the raw water and that of the various effluents. The positiveness with which this trend of the data is shown in each individual instance clearly indicates that the existence of a relation between raw water and effluents in respect to bacterial quality is to a large extent independent of the amount of turbidity present in the raw water.

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[17] These evidences of secondary multiplications were manifested usually by increases in the numbers of plate count growers appearing in the effluent, as compared with the numbers observed coincidently in the influent, of a particular stage of treatment. Occasionally, as at the Steubenville plant (see Appendix A), corresponding evidences were found of a consistently observed increase in the numbers of *B. coli*, particularly at the primary stage of sedimentation. Evidence of this character was not conclusive, however, owing to the possibility that it represented either the effect of an unbalanced sampling error or that it was due to the inherent errors of individual determinations of the *B. coli* index.

[18] The test in question were made on a series of approximately 100 duplicate samples of water collected from the Des Plaines River at Joliet, Ill., during the years 1921 and 1922. The results of these tests thus far have been unpublished, as it has been desired to confirm them by a longer series of observations.

Table No. 35.—*Relations between averages of numbers of bacteria in raw water falling within specified turbidity and bacterial ranges and averages of corresponding numbers observed at various stages of treatment—Summary of group averages; raw-water turbidities 0–100, 101–500, and over 500, grouped by raw-water counts*

A. 48-HOUR AGAR COUNT, 20° C

STEUBENVILLE

Raw-water count range	Number of items	Average turbidity	Average bacterial count per cubic centimeter					Per cent of raw-water count			
			Raw	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated
Raw-water turbidity=0–100:											
0–100	7	25	67	53	31	21	0.5	79.1	46.3	31.4	0.75
101–250	14	33	195	102	69	47	19	52.3	35.5	24.1	9.7
251–500	15	25	397	258	144	92	19	65.0	36.3	23.2	4.8
501–1,500	30	42	968	707	249	153	20	73.0	25.8	15.8	2.1
Over 1,500	35	49	2,570	1,750	659	264	52	68.1	25.6	10.3	2.0
Mean		35						67.5	33.9	21.0	3.8
Raw-water turbidity=101–500:											
0–500	1	112	500	(1)	(1)	250	200			50.0	[2] 40.0
Over 1,500	18	237	4,320	2,540	571	221	82	58.9	13.2	5.1	1.9
Mean		174						58.9	13.2	27.6	1.9
Raw-water turbidity=over 500:											
0–1,000	1	1,000	7,200	(1)	750	600	50		10.4	8.3	.69
Mean		1,000							10.4	8.3	.69
IRONTON											
Raw-water turbidity=0–100:											
0–2,500	19	49	2,050	261	82	5.5	2.1	12.7	4.0	0.27	0.10
2,501–5,000	25	43	3,940	435	163	5.0	1.6	11.0	4.1	.13	.041
5,001–10,000	19	66	7,340	709	253	18.0	2.6	9.6	3.4	.24	.035
Over 10,000	27	87	21,000	1,430	329	24.0	3.5	6.8	1.6	.11	.017
Mean		61						10.0	3.3	.19	.048
Raw-water turbidity=101–500:											
0–2,500	1	150	2,300	250	200	5.0	1.03	10.9	8.7	.22	.043
2,501–5,000	15	292	4,290	423	104	4.5	.93	9.9	2.4	.10	.022
5,001–10,000	34	241	7,670	944	264	7.0	2.3	12.3	3.4	.091	.030
Over 10,000	106	255	32,200	2,790	744	45.0	4.0	8.7	2.3	.14	.012
Mean		234						10.4	4.2	.14	.027
Raw-water turbidity=over 500:											
0–2,500	1	625	2,500	125	30	0	2.0	5.0	1.2	.00	.080
2,501–5,000	4	774	4,200	448	173	11	6.0	10.7	4.1	.26	.14
5,001–10,000	10	735	7,800	1,550	410	55	2.7	19.9	5.3	.70	.035
Over 10,000	17	772	53,500	4,610	1,400	74	6.7	8.6	2.6	.14	.013
Mean		726						11.0	3.3	.28	.067

[1] Increase.

[2] Excluded from mean.

Table No. 35.—*Relations between averages of numbers of bacteria in raw water falling within specified turbidity and bacterial ranges and averages of corresponding numbers observed at various stages of treatment—Summary of group averages; raw-water turbidities 0–100, 101–500, and over 500, grouped by raw-water counts*—Continued

A. 48-HOUR AGAR COUNT, 20° C.—Continued

PORTSMOUTH

Raw-water count range	Number of items	Average turbidity	Average bacterial count per cubic centimeter					Per cent of raw-water count			
			Raw	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated
Raw-water turbidity=0-100:											
0-1,500	53	29	1,160	374	262	25	0.15	32.2	22.6	2.2	0.013
1,501-2,500	41	28	1,980	583	314	39	.24	29.5	15.8	2.0	.012
2,501-5,000	59	64	3,740	749	451	44	.37	20.0	12.1	1.2	.010
5,001-10,000	40	79	7,300	1,230	717	56	.58	16.8	9.8	.77	.008
10,001-20,000	3	87	11,700	1,480	933	87	0	12.6	8.0	.74	0
Over 20,000	4	99	28,800	3,900	2,500	235	.25	13.5	8.7	.82	.001
Mean		64						20.8	12.8	1.29	.007
Raw-water turbidity=101-500:											
0-5,000	21	192	4,210	783	561	50	.19	18.6	13.3	1.2	.004
5,001-10,000	54	229	7,780	993	629	63	.70	12.8	8.1	.81	.009
10,001-20,000	41	226	14,700	1,710	1,020	100	.78	11.6	6.9	.68	.005
Over 20,000	41	256	35,800	3,480	2,050	206	1.6	9.7	5.7	.57	.004
Mean		226						13.2	8.5	.82	.006
Raw-water turbidity=over 500:											
10,000-60,000	9	856	28,300	2,330	1,580	107	0	8.2	5.6	.38	0
Mean		856						8.2	5.6	.38	0

CINCINNATI

Raw-water count range	Number of items	Average turbidity	Raw	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated
Raw-water turbidity=0-100:											
0-250	23	31	145	150	102	17.0	3.2	[3] 100.0+	70.2	11.7	2.2
251-500	25	41	378	178	91	13.0	3.9	47.0	24.1	3.4	1.0
501-2,500	32	65	1,170	451	245	21.0	2.5	38.6	20.9	1.8	.21
2,501-10,000	12	71	5,360	1,690	412	48.0	2.5	31.5	7.7	.89	.047
Over 10,000	4	94	27,400	4,030	1,230	128.0	1.5	14.7	4.5	.47	.005
Mean		60						33.0	25.5	3.6	.69
Raw-water turbidity=101-500:											
0-250	2	135	100	(4)	(4)	48.0	2.0	[3]100.0+	[3]100+	48.0	2.0
251-500	4	184	400	(4)	248	32.0	2.9	[3]100.0+	62.0	8.0	.72
501-2,500	44	181	1,640	615	134	9.4	3.4	37.5	8.2	.57	.21
2,501-10,000	73	221	5,170	1,370	254	27.0	2.7	26.5	4.9	.52	.052
10,001-50,000	70	243	25,700	4,860	830	130.0	5.0	18.9	3.2	.51	.019
Over-50,000	30	287	91,900	8,060	1,220	180.0	2.3	8.8	1.3	.20	.002
Mean		208						22.9	15.9	9.6	.50
Raw-water turbidity=over 500:											
501-2,000	1	820	2,000	1,200	130	14.0	0	60.0	6.5	.70	0
2,001-10,000	18	882	6,510	1,340	112	10.0	3.7	20.6	1.7	.15	.057
10,001-50,000	15	781	19,800	3,320	664	88.0	1.7	16.8	3.4	.44	.009
Over 50,000	12	846	81,100	8,230	1,120	195.0	3.2	10.2	1.4	.24	.004
Mean		832						26.9	3.2	.38	.018

[3] Omitted from average.

[4] All results show increase.

TABLE No. 35.—*Relations between averages of numbers of bacteria in raw water falling within specified turbidity and bacterial ranges and averages of corresponding numbers observed at various stages of treatment—Summary of group averages; raw-water turbidities 0–100, 101–500, and over 500, grouped by raw-water counts*—Continued

A. 48-HOUR AGAR COUNT, 20° C.—Continued

LOUISVILLE

Raw-water count range	Number of items	Average turbidity	Average bacterial count per cubic centimeter					Per cent of raw-water count			
			Raw	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated
Raw-water turbidity=0–100:											
0–1,000	12	37	631	1,100	500	359	9.2	[2]100.0+	79.2	56.9	1.4
1,001–10,000	42	60	4,380	2,170	1,160	108	8.5	49.5	26.5	2.5	.19
10,001–25,000	8	88	13,700	11,000	2,980	766	8.4	80.3	21.8	5.6	.061
Over 25,000	7	88	29,000	15,200	4,160	1,680	17.0	52.4	14.3	5.8	.059
Mean		68						60.7	35.4	17.7	.43
Raw-water turbidity=101–500:											
1,001–10,000	68	211	6,130	4,050	1,210	169	5.7	66.1	19.7	2.7	.093
10,001–25,000	75	263	16,300	10,100	1,680	361	8.4	62.0	10.3	2.2	.052
Over 25,000	24	287	35,300	21,200	2,800	1,010	16.0	60.1	7.9	2.9	.045
Mean		254						62.7	12.6	2.6	.063
Raw-water turbidity=over 500:											
1,001–10,000	6	592	8,370	5,450	1,660	142	3.3	65.1	19.9	1.7	.039
10,001–25,000	17	643	20,600	11,700	1,560	471	12.5	56.8	7.5	2.3	.061
Over 25,000	28	808	35,700	17,400	1,700	814	12.0	48.8	4.8	2.3	.034
Mean		681						56.9	10.7	2.1	.045

[2] Excluded from mean.

EVANSVILLE

Raw-water count range	Number of items	Average turbidity	Average bacterial count per cubic centimeter			Per cent of raw-water count	
			Raw	Applied	Chlorinated	Applied	Chlorinated
Raw-water turbidity=0–100:							
0–500	26	19	446	142	4.5	31.8	1.0
501–1,000	40	43	813	297	6.2	36.5	.76
1,001–2,000	25	64	1,700	532	6.1	31.3	.36
2,001–3,500	10	80	2,960	560	11.0	18.9	.37
Over 3,500	19	81	7,870	1,120	48.0	14.2	.61
Mean		57				26.5	.62
Raw-water turbidity=101–500:							
0–1,000	5	136	940	196	7.8	20.8	.83
1,001–2,000	19	201	1,730	363	5.0	21.0	.29
2,001–3,500	22	229	2,630	497	4.5	18.9	.17
Over 3,500	168	243	23,700	2,030	3.2	8.6	.014
Mean		202				17.3	.33
Raw-water turbidity=over 500:							
0–3,500	2	600	3,200	175	4.0	5.5	.12
Over 3,500	32	837	41,000	3,320	4.1	8.1	.01
Mean		718				6.8	.06

TABLE NO. 35.—*Relations between averages of numbers of bacteria in raw water falling within specified turbidity and bacterial ranges and averages of corresponding numbers observed at various stages of treatment—Summary of group averages; raw-water turbidities 0–100, 101–500, and over 500, grouped by raw-water counts*—Continued

B.—24-HOUR AGAR COUNT, 37° C.

EAST LIVERPOOL

Raw-water count range	Number of items	Average turbidity	Average bacterial count per cubic centimeter				Per cent of raw-water count		
			Raw	Applied	Filtered	Chlorinated	Applied	Filtered	Chlorinated
Raw-water turbidity = 0–100:									
0–500	45	43	280	105	45.0	1.1	37.5	16.0	0.39
501–1,000	31	41	785	181	89.0	2.3	23.1	8.8	.29
1,001–2,000	36	43	1,620	616	171.0	8.6	38.0	10.5	.53
2,001–3,000	30	37	2,540	618	127.0	12.0	24.3	5.0	.47
3,001–5,000	37	36	3,840	1,180	257.0	20.0	30.7	6.7	.52
Over 5,000	48	35	12,200	1,830	644.0	27.0	15.0	5.3	.22
Mean		39					28.1	8.7	.40
Raw-water turbidity = 101–500:									
0–500	8	216	295	90	9.6	1.3	33.5	3.3	.44
501–1,000	9	183	763	110	3.9	.6	14.4	.51	.08
1,001–2,000	16	218	1,570	179	9.0	1.1	11.4	.57	.07
2,001–3,000	17	221	2,650	426	23.0	24.0	16.1	.86	.91
3,001–5,000	15	277	4,210	323	33.0	2.3	7.7	.78	.05
Over 5,000	16	289	8,500	874	133.0	12.0	10.3	1.6	.14
Mean		234					15.6	1.27	.28
Raw-water turbidity = over 500:									
0–2,000	3	1,200	1,630	133	1.3	.3	8.2	.08	.02
2,001–3,000	5	710	2,700	168	10.0	1.4	6.2	.37	.05
3,001–5,000	7	1,100	5,000	287	27.0	19.0	5.7	.54	.38
Over 5,000	13	1,070	13,700	1,820	417.0	118.0	13.2	3.0	.86
Mean		1,020					8.3	1.00	.33

STEUBENVILLE

Raw-water count range	Number of items	Average turbidity	Average bacterial count per cubic centimeter					Per cent of raw-water count			
			Raw	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated
Raw-water turbidity = 0–100:											
0–100	118	25	49	35	11	2.2	0.64	71.5	22.5	4.5	1.3
101–250	68	29	161	87	21	5.3	.79	54.0	13.0	3.3	.49
251–500	36	30	364	153	98	19.0	.39	42.0	26.9	5.2	.11
501–1,500	34	21	965	360	141	33.0	4.7	37.3	14.6	3.4	.49
Over 1,500	32	29	3,740	1,070	214	81.0	1.6	28.6	5.7	2.2	.043
Mean		27						46.7	16.5	3.7	.49
Raw-water turbidity = 101–500:											
0–250	6	132	148	60	12	.67	.17	40.5	8.1	.45	.11
251–500	12	229	349	195	38	5.7	.50	55.9	10.9	1.6	.14
501–1,500	6	161	992	162	36	5.8	.67	16.3	3.6	.58	.067
Over 1,500	12	215	2,670	1,380	306	41.0	1.9	51.8	11.5	1.5	.071
Mean		184						41.1	8.5	1.03	.10
Raw-water turbidity = over 500:											
0–12,000	2	770	6,350	4,070	385	129.0	7.0	64.0	6.1	2.0	.11
Mean		770						64.0	6.1	2.0	.11

TABLE No. 35.—*Relations between averages of numbers of bacteria in raw water falling within specified turbidity and bacterial ranges and averages of corresponding numbers observed at various stages of treatment—Summary of group averages; raw-water turbidities 0–100, 101–500, and over 500, grouped by raw-water counts*—Continued

B.—24-HOUR AGAR COUNT, 37° C.—Continued

HUNTINGTON

Raw-water count range	Number of items	Average turbidity	Average bacterial count per cubic centimeter				Per cent of raw-water count		
			Raw	Applied	Filtered	Chlorinated	Applied	Filtered	Chlorinated
Raw-water turbidity=0-100:									
0–500	68	67	262	94	3.9	0.81	35.8	1.5	0.31
501–1,000	39	55	814	308	13.0	1.7	37.8	1.6	.21
1,001–2,000	23	52	1,580	611	22.0	2.1	38.7	1.4	.13
2,001–5,000	16	50	3,530	1,130	37.0	2.4	32.0	1.0	.068
Over 5,000	2	40	8,500	3,250	65.0	2.0	38.2	.76	.024
Mean		53					36.5	1.2	.15
Raw-water turbidity=101-500:									
0–500	19	211	250	72	4.1	.74	28.8	1.6	.30
501–1,000	35	234	870	217	8.5	1.4	25.0	.98	.16
1,001–2,000	39	255	1,560	492	14.0	2.2	31.5	.90	.14
2,001–5,000	40	292	3,460	1,040	26.0	1.7	30.1	.75	.049
Over 5,000	2	180	6,500	2,250	55.0	3.5	34.6	.85	.054
Mean		243					30.0	1.0	.14
Raw-water turbidity=over 500:									
0–1,000	2	650	665	74	2.0	1.5	11.1	.30	.23
1,001–5,000	16	805	2,540	601	21.0	2.1	23.7	.83	.083
Over 5,000	4	1,040	7,000	1,880	61.0	2.8	26.8	.87	.040
Mean		832					20.5	.67	.12

ASHLAND

Raw-water count range	Number of items	Average turbidity	Raw	Applied	Filtered	Chlorinated	Applied	Filtered	Chlorinated
Raw-water turbidity=0-100:									
0–250	12	26	155	53	5.3	0.50	34.2	3.4	0.32
251–500	24	74	377	84	9.9	1.1	22.3	2.6	.29
501–1,000	42	60	783	151	14.0	1.2	19.2	1.8	.14
1,001–2,000	34	55	1,410	222	26.0	.74	15.8	1.8	.052
Over 2,000	4	64	2,650	260	17.0	.75	9.8	.64	.028
Mean		56					20.3	2.0	.17
Raw-water turbidity=101-500:									
0–250	9	201	183	69	6.0	1.1	37.7	3.3	.60
251–500	34	245	371	75	5.1	1.6	20.2	1.4	.43
501–1,000	47	280	744	88	7.0	1.0	11.8	.94	.13
1,001–2,000	41	265	1,420	116	13.0	1.2	8.2	.91	.084
Over 2,000	14	226	3,790	146	16.0	.57	3.9	.42	.015
Mean		243					16.4	1.4	.25
Raw-water turbidity=over 500:									
0–250	3	1,130	157	32	3.3	.33	20.4	2.1	.21
251–500	11	968	341	70	7.8	.91	20.5	2.3	.27
501–1,000	12	1,400	771	136	2.5	.42	17.6	.32	.054
1,001–2,000	21	1,420	1,440	116	4.5	.86	8.0	.31	.060
Over 2,000	9	1,030	2,900	124	2.1	.56	4.3	.07	.019
Mean		1,190					14.2	1.0	.12

Table No. 35.—*Relations between averages of numbers of bacteria in raw water falling within specified turbidity and bacterial ranges and averages of corresponding numbers observed at various stages of treatment—Summary of group averages; raw-water turbidities 0–100, 101–500, and over 500, grouped by raw-water counts*—Continued

B.—24-HOUR AGAR COUNT, 37° C.—Continued

IRONTON

Raw-water count range	Number of items	Average turbidity	Average bacterial count per cubic centimeter					Per cent of raw-water count			
			Raw	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated
Raw-water turbidity=0–100:											
0–2,500	35	77	1,610	151	62	3.5	0.63	9.4	3.8	0.22	0.039
2,501–5,000	27	50	3,550	372	111	9.2	2.4	10.5	3.1	.26	.068
5,001–10,000	19	44	6,840	666	201	14.0	2.2	9.7	2.9	.20	.032
Over 10,000	3	80	23,400	4,000	412	28.0	2.7	17.1	1.8	.12	.012
Mean	------	63	------	------	------	------	------	11.7	2.9	.20	.038
Raw-water turbidity=101–500:											
0–2,500	83	222	1,590	192	44	1.5	.52	12.1	2.8	.094	.033
2,501–5,000	51	270	3,630	406	132	3.4	1.6	11.2	3.6	.094	.044
5,001–10,000	15	369	7,030	630	155	4.5	1.3	9.0	2.2	.064	.019
Over 10,000	10	214	19,600	2,630	533	37.0	5.2	13.4	2.7	.19	.026
Mean	------	269	------	------	------	------	------	11.4	2.8	.11	.030
Raw-water turbidity=over 500:											
0–2,500	5	587	1,630	210	56	1.2	.0	12.9	3.4	.074	.000
2,501–5,000	15	794	3,840	423	80	3.9	1.1	11.0	2.1	.10	.029
5,001–10,000	7	729	7,850	837	175	6.0	2.0	10.6	2.2	.076	.025
Over 10,000	4	861	18,400	1,260	353	7.3	.75	6.8	1.9	.040	.004
Mean	------	743	------	------	------	------	------	10.3	2.4	.072	.014

PORTSMOUTH

Raw-water count range	Number of items	Average turbidity	Average bacterial count per cubic centimeter					Per cent of raw-water count			
			Raw	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated
Raw-water turbidity=0–100:											
0–500	62	61	310	53	26	0.32	0	17.1	8.4	0.10	0
501–1,000	68	56	781	182	120	7.1	.01	23.3	15.3	.91	.001
1,001–1,500	40	30	1,310	465	256	20.0	.08	35.5	19.5	1.5	.006
1,501–3,000	28	47	1,980	499	311	23.0	.11	25.1	15.7	1.2	.006
Over 3,000	3	38	3,530	400	317	25.0	.33	11.3	9.0	.71	.009
Mean	------	46	------	------	------	------	------	22.5	13.6	.88	.004
Raw-water turbidity=101–500:											
0–500	19	139	423	59	32	.05	.0	14.0	7.6	.012	.000
501–1,000	60	198	810	139	81	.25	.0	17.2	10.0	.031	.000
1,001–1,500	24	261	1,280	233	144	2.0	.0	18.2	11.2	.16	.000
1,501–3,000	29	266	2,320	400	252	7.6	.07	17.2	10.9	.33	.003
Over 3,000	24	313	4,610	630	449	21.0	.04	13.6	9.7	.46	.001
Mean	------	235	------	------	------	------	------	16.0	9.9	.20	.001
Raw-water turbidity=over 500:											
1,501–3,000	5	870	2,540	416	225	4.0	.0	16.4	8.9	.16	.000
Over 3,000	4	838	6,250	738	438	17.0	.0	11.8	7.0	.27	.000
Mean	------	854	------	------	------	------	------	14.1	8.0	.22	.000

Table No. 35.—*Relations between averages of numbers of bacteria in raw water falling within specified turbidity and bacterial ranges and averages of corresponding numbers observed at various stages of treatment—Summary of group averages; raw-water turbidities 0–100, 101–500, and over 500, grouped by raw-water counts*—Continued

B.—24-HOUR AGAR COUNT, 37° C.—Continued

CINCINNATI

Raw-water count range	Number of items	Average turbidity	Average bacterial count per cubic centimeter					Per cent of raw-water count			
			Raw	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated
Raw-water turbidity = 0-100:											
0-100	46	44	59	46	25	6.4	0.91	77.9	42.4	10.8	1.5
101-250	25	61	159	95	44	4.8	2.2	59.8	27.7	3.0	1.4
251-500	12	63	350	145	156	11.0	3.3	41.4	44.6	3.1	.94
501-1,000	4	78	765	203	345	13.0	3.5	26.5	45.1	1.7	.46
Over 1,000	8	84	1,360	448	236	13.0	4.0	33.0	17.4	.96	.29
Mean		66						47.7	35.4	3.9	.92
Raw-water turbidity = 101-500:											
0-100	40	184	75	51	12	.55	.35	68.0	16.0	.73	.47
101-250	38	183	167	18	14	1.6	.61	10.8	8.4	.96	.36
251-500	141	230	373	124	23	1.3	1.0	33.2	6.2	.35	.27
501-1,000	41	258	710	201	74	3.8	1.8	28.3	10.4	.54	.25
1,001-2,500	41	257	1,520	417	99	7.9	3.0	27.4	6.5	.52	.20
Over 2,500	16	262	3,670	930	291	27.0	9.0	25.3	7.9	.74	.24
Mean		229						32.2	9.2	.64	.30
Raw-water turbidity = over 500:											
0-100	3	697	63	89	23	1.3	.33	[2] +100.0	36.5	2.1	.52
101-250	2	690	155	39	4	.5	0	25.2	2.6	.32	0
251-500	4	678	450	142	65	1.5	1.0	31.5	14.5	.33	.22
501-1,000	2	525	850	190	20	1.0	.5	22.3	2.4	.12	.059
1,001-2,500	17	794	1,660	433	61	3.2	1.5	26.1	3.7	.19	.090
Over 2,500	18	988	6,530	880	182	33.0	2.4	13.5	2.8	.50	.037
Mean		729						123.7	10.4	.59	.15

[2] Excluded from mean.

LOUISVILLE

Raw-water count range	Number of items	Average turbidity	Average bacterial count per cubic centimeter		Per cent of raw-water count, chlorinated
			Raw	Chlorinated	
Raw-water turbidity = 0-100:					
0-500	28	19	273	13.0	4.7
501-1,000	42	45	789	30.0	3.8
1,001-1,500	20	50	1,305	16.0	1.2
1,501-2,500	15	61	1,890	6.4	.34
Over 2,500	9	69	2,870	2.2	.08
Mean		49			2.0
Raw-water turbidity = 101-500:					
0-500	1	240	400	4.0	1.0
501-1,000	35	181	734	4.6	.62
1,001-1,500	42	240	1,320	4.5	.34
1,501-2,500	51	276	1,960	2.7	.14
Over 2,500	39	268	4,180	4.4	.11
Mean		241			.44
Raw-water turbidity = over 500:					
501-1,000	1	610	800	6.0	.75
1,001-1,500	5	664	1,200	3.4	.28
1,501-2,500	15	648	1,940	4.6	.24
Over 2,500	30	782	4,910	4.6	.09
Mean		676			.34

Table No. 35.—*Relations between averages of numbers of bacteria in raw water falling within specified turbidity and bacterial ranges and averages of corresponding numbers observed at various stages of treatment—Summary of group averages; raw-water turbidities 0–100, 101–500, and over 500, grouped by raw-water counts*—Continued

B.—24-HOUR AGAR COUNT, 37° C.—Continued

EVANSVILLE

Raw-water count range	Number of items	Average turbidity	Average bacterial count per cubic centimeter			Per cent of raw-water count	
			Raw	Applied	Chlorinated	Applied	Chlorinated
Raw-water turbidity=0-100:							
0-1,000	26	33	912	510	7.5	55.9	0.82
1,001-1,500	21	60	1,480	859	9.7	58.0	.66
1,501-2,000	21	54	1,890	860	11.0	45.5	.58
2,001-5,000	31	58	3,160	895	11.0	28.3	.35
Over 5,000	20	61	5,870	1,330	11.0	22.6	.19
Mean		53				42.1	.52
Raw-water turbidity=101-500:							
0-1,000	12	190	921	220	2.0	23.9	.22
1,001-1,500	20	186	1,370	202	2.4	14.8	.18
1,501-2,000	19	245	1,850	424	2.9	22.9	.16
2,001-5,000	111	237	3,320	535	6.4	16.1	.19
Over 5,000	51	262	12,450	990	7.9	8.0	.064
Mean		224				17.1	.16
Raw-water turbidity=over 500:							
0-5,000	14	632	3,700	329	5.6	8.9	.15
Over 5,000	18	1,060	11,270	911	6.0	8.1	.053
Mean		846				8.5	.10

HENDERSON [5]

Raw-water count range	Number of items	Average turbidity	Average bacterial count per cubic centimeter				Per cent of raw-water count		
			Raw	Applied	Filtered	Chlorinated	Applied	Filtered	Chlorinated
Raw-water turbidity=0-100:									
0-2,500	29	48	2.010	538	53	5.0	26.8	2.6	0.25
2,501-3,500	30	42	3,110	748	47	6.8	24.0	1.5	.22
3,501-5,000	15	42	4,120	701	33	5.5	17.0	.8	.13
5,001-7,500	4	55	5,780	800	70	4.5	13.8	1.2	.078
7,501-10,000	3	47	9,330	1,050	170	3.3	11.2	1.8	.035
Over 10,000	4	83	18,300	1,430	233	11.0	7.8	1.3	.060
Mean		53					16.8	1.5	.13
Raw-water turbidity=101-500:									
0-2,500	22	199	1,800	636	22	5.0	35.4	1.2	.28
2,501-3,500	14	279	3,040	855	31	5.5	28.1	1.0	.18
3,501-5,000	24	266	4,300	1,060	70	8.7	24.6	1.6	.20
5,001-7,500	8	319	6,150	1,080	156	12.0	17.5	2.5	.20
7,501-10,000	6	295	8,830	1,330	87	6.0	15.0	.98	.068
Over 10,000	13	285	20,300	3,360	248	27.0	16.5	1.2	.13
Mean		274					22.8	1.4	.18
Raw-water turbidity=over 500:									
0-2,500	2	650	2,250	625	17	5.5	27.8	.76	.24
2,501-3,500	2	550	2,850	760	18	5.0	26.7	.63	.18
3,501-5,000	2	750	4,500	1,080	35	6.0	24.0	.78	.13
5,001-7,500	4	600	5,930	975	21	5.8	16.4	.35	.098
Over 7,500	2	725	8,000	850	29	8.0	10.6	.36	.10
Mean		655					21.1	.58	.15

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[5] 48-hour count at 37° C.

Table No. 35.—*Relations between averages of numbers of bacteria in raw water falling within specified turbidity and bacterial ranges and averages of corresponding numbers observed at various stages of treatment—Summary of group averages; raw-water turbidities 0–100, 101–500, and over 500, grouped by raw-water counts*—Continued

C.—B. COLI INDEX

E. LIVERPOOL, OHIO

Raw-water turbidity=0–100

B. coli in raw water		Number of items	Average turbidity	B. coli index per 100 c. c.				Per cent of raw-water index		
(+) in c. c.	(−) in c. c.			Raw	Applied	Filtered	Chlorinated	Applied	Filtered	Chlorinated
10	1	49	34	10	8.6	1.3	0.47	86.0	13.0	4.7
1	.1	69	46	100	72.0	2.1	.75	72.0	2.1	.75
.1	.01	34	66	1,000	505.0	2.0	.47	50.5	.2	.047
.01	.001	11	65	10,000	2,060.0	3.5	1.5	20.6	.035	.015
.001	.0001	1	100	100,000	1,000.0	0	0	1.0	0	0
Mean			62					46.0	3.067	1.102

Raw-water turbidity=101–500

B. coli in raw water		Number of items	Average turbidity	B. coli index per 100 c. c.				Per cent of raw-water index		
(+) in c. c.	(−) in c. c.			Raw	Applied	Filtered	Chlorinated	Applied	Filtered	Chlorinated
1	0.1	20	200	100	58.0	2.0	0	58.0	2.0	0
.1	.01	30	247	1,000	600.0	3.0	.22	60.0	.3	.022
.01	.001	30	248	10,000	2,870.0	3.3	.28	28.7	.033	.0028
.001	.0001	1	150	100,000	1,000.0	10.0	1.0	1.0	.01	0
Mean			211					36.9	.586	.0062

Raw-water turbidity=over 500

B. coli in raw water		Number of items	Average turbidity	B. coli index per 100 c. c.				Per cent of raw-water index		
(+) in c. c.	(−) in c. c.			Raw	Applied	Filtered	Chlorinated	Applied	Filtered	Chlorinated
1	0.1	5	900	100	70.0	0	0	70.0	0	0
.1	.01	9	978	1,000	380.0	3.6	0	38.0	.36	0
.01	.001	12	1,110	10,000	4,530.0	5.0	1.2	45.3	.05	.012
Mean			996					51.1	.14	.004

STEUBENVILLE, OHIO

Raw-water turbidity=0–100

B. coli in raw water		Number of items	Average turbidity	B. coli index per 100 c. c.					Per cent of raw-water index			
(+) in c. c.	(−) in c. c.			Raw	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated
10	1	114	25	10	5.9	5.3	0.42	0.11	59.0	53.0	4.2	1.1
1	.1	70	39	100	41.0	19.0	.74	.11	41.0	19.0	.74	.11
.1	.01	14	48	1,000	235.0	55.0	1.1	.57	23.5	5.5	.11	.057
.01	.001	4	22	10,000			0	0			0	0
Mean			34						41.2	25.8	1.68	.422

Raw-water turbidity=101–500

B. coli in raw water		Number of items	Average turbidity	B. coli index per 100 c. c.					Per cent of raw-water index			
(+) in c. c.	(−) in c. c.			Raw	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated
10	1	10	179	10		10.0	0.4	1.2		100.0	4.0	12.0
1	.1	9	191	100	64.0	6.0	1.1	.9	64.0	6.0	.1	.9
.1	.01	8	195	1,000	683.0	343.0	4.5	1.3	68.3	34.3	.45	.13
.01	.001	4	248	10,000	3,700.0	1,000.0	4.0	2.0	37.0	10.0	.04	.02
Mean			203						56.4	37.6	1.40	3.26

Raw-water turbidity=over 500

B. coli in raw water		Number of items	Average turbidity	B. coli index per 100 c. c.					Per cent of raw-water index			
(+) in c. c.	(−) in c. c.			Raw	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated
0.1	0.01	1	540	1,000			0	0			0	0
.01	.001	1	1,000	10,000		1,000.0	10.0	2.0		10.0	.10	.02
Mean			770							10.0	.05	.01

Table No. 35.—*Relations between averages of numbers of bacteria in raw water falling within specified turbidity and bacterial ranges and averages of corresponding numbers observed at various stages of treatment—Summary of group averages; raw-water turbidities 0–100, 101–500, and over 500, grouped by raw-water counts*—Continued

C.—B. COLI INDEX—Continued

HUNTINGTON, W. VA.

Raw-water turbidity=0-100

B. coli in raw water		Number of items	Average turbidity	B. coli index per 100 c. c.			Per cent of raw-water index	
(+) in c. c.	(−) in c. c.			Raw	Filtered	Chlorinated	Filtered	Chlorinated
10	1	10	28	10	1	0	10.0	0
1	.1	15	59	100	42	.53	42.0	.53
.1	.01	114	59	1,000	57	.61	5.7	.061
.01	.001	11	75	10,000	42	1.6	.42	.016
Mean	----------	----------	55	----------	----------	----------	14.5	.152

Raw-water turbidity=101-500

10	1	1	350	10	0	0	0	0
1	.1	8	226	100	43	0	43.0	0
.1	.01	96	251	1,000	50	.56	5.0	.056
.01	.001	29	270	10,000	19	0	.19	0
Mean	----------	----------	274	----------	----------	----------	12.1	.014

Raw-water turbidity=over 500

1	0.1	1	550	100	0	0	0	0
.1	.01	20	810	1,000	49	1.1	4.9	.11
.01	.001	2	1,300	10,000	55	0	.55	0
Mean	----------	----------	867	----------	----------	----------	1.82	.04

ASHLAND, KY.

Raw-water turbidity=0-100

B. coli in raw water		Number of items	Average turbidity	B. coli index per 100 c. c.				Per cent of raw-water index		
(+) in c. c.	(−) in c. c.			Raw	Applied	Filtered	Chlorinated	Applied	Filtered	Chlorinated
10	1	1	40	10	----------	6.0	0	----------	60.0	0
1	.1	20	77	100	86	3.3	0	86.0	3.3	0
.1	.01	54	54	1,000	358	5.0	.15	35.8	.5	.015
.01	.001	34	53	10,000	3,580	7.4	.24	35.8	.074	.0024
.001	.0001	7	64	100,000	1,900	4.6	0	1.9	.0046	0
Mean	----------	--------	58	----------	----------	--------	--------	39.9	12.8	.0035

Raw-water turbidity=101-500

10	1	4	180	10	7.5	0	0	75.0	0	0
1	.1	20	288	100	91.0	2.8	.5	91.0	2.8	.5
.1	.01	62	237	1,000	272.0	2.8	0	27.2	.28	0
.01	.001	48	272	10,000	3,560.0	2.3	.08	35.6	.023	.0008
.001	.0001	11	290	100,000	1,500.0	2.0	0	1.5	.002	0
Mean	----------	--------	253	----------	----------	--------	--------	46.1	.621	.1002

Raw-water turbidity=over 500

10	1	1	1,400	10	0	0	0	0	0	0
1	.1	14	1,170	100	66	.29	0	66.0	.29	0
.1	.01	16	1,180	1,000	169	3.2	0	16.9	.32	0
.01	.001	19	946	10,000	2,820	2.3	0	28.2	.023	0
.001	.0001	6	2,550	100,000	5,500	.67	0	5.5	.0067	0
Mean	----------	--------	1,449	----------	----------	--------	--------	23.3	.1279	0

Table No. 35.—*Relations between averages of numbers of bacteria in raw water falling within specified turbidity and bacterial ranges and averages of corresponding numbers observed at various stages of treatment—Summary of group averages; raw-water turbidities 0–100, 101–500, and over 500, grouped by raw-water counts*—Continued

C.—B. COLI INDEX—Continued

IRONTON, OHIO

Raw-water turbidity=0–100

B. coli in raw water		Number of items	Average turbidity	B. coli index per 100 c. c.					Per cent of raw-water index			
(+) in c. c.	(−) in c. c.			Raw	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated
0.1	0.01	9	88	1,000	190	80	1.3	0	19.0	8.0	0.13	0
.01	.008	23	80	10,000	827	107	.61	0	8.3	1.1	.006	0
.008	.006	29	56	12,500	1,770	195	1.4	.07	14.2	1.6	.011	.0006
.006	.003	22	47	16,700	2,610	279	2.2	.09	15.6	1.7	.013	.0005
.003	.001	11	58	33,300	2,460	231	3.8	.36	7.4	.7	.011	.0011
Mean			66						12.9	2.6	.034	.0004

Raw-water turbidity=101–500

0.1	0.01	20	212	1,000	140	99	4.6	0	14.0	9.9	0.46	0
.01	.008	50	217	10,000	723	88	.6	.4	7.2	.88	.006	.004
.008	.006	52	277	12,500	1,270	111	.92	.08	10.1	.89	.007	.0006
.006	.003	29	273	16,700	1,420	167	1.2	.28	8.5	1.0	.007	.0017
.003	.001	10	273	33,300	2,120	167	2.0	0	6.4	.5	.006	0
Mean			250						9.2	2.63	.097	.0013

Raw-water turbidity=over 500

0.1	0.01	7	650	1,000	100	100	4.3	0	10.0	10.0	0.43	0
.01	.008	2	625	10,000	550	55	1.0	.0	5.5	.55	.01	.0
.008	.006	5	612	12,500	1,290	160	1.2	0	10.3	1.3	.0096	.0
.006	.003	12	762	16,700	1,620	133	1.8	.17	9.7	.8	.011	.001
.003	.001	7	954	33,300	2,630	205	3.1	0	7.9	.62	.0093	0
Mean			722						8.7	2.65	.094	.0002

PORTSMOUTH, OHIO

Raw-water turbidity=0–100

1	0.1	8	14	100	78	21	0.38	0	78.0	21.0	0.38	0
.1	.01	173	49	1,000	244	66	2.0	.03	24.4	6.6	.20	.003
.01	.001	17	62	10,000	518	127	.65	0	5.2	1.3	.0065	0
Mean			42						35.9	9.6	.196	.001

Raw-water turbidity=101–500

1	0.1	1	180	100	10	10	2.0	0	10.0	10.0	2.0	0
.1	.01	94	212	1,000	148	63	.88	.01	14.8	6.3	.088	.001
.01	.001	63	262	10,000	617	90	1.2	0	6.2	.9	.012	0
Mean			218						10.3	5.7	.700	.0003

Raw-water turbidity=over 500

0.1	0.01	1	550	1,000	1,000	100	4.0	0	100.0	10.0	0.40	0
.01	.001	9	950	10,000	700	100	1.4	0	7.0	1.0	.014	0
Mean			750						53.5	5.5	.207	0

Table No. 35.—*Relations between averages of numbers of bacteria in raw water falling within specified turbidity and bacterial ranges and averages of corresponding numbers observed at various stages of treatment—Summary of group averages; raw-water turbidities 0–100, 101–500, and over 500, grouped by raw-water counts*—Continued.

C.—B. COLI INDEX—Continued

CINCINNATI, OHIO

Raw-water turbidity=0–100

B. coli in raw water		Number of items	Average turbidity	B. coli index per 100 c. c.					Per cent of raw-water index			
(+) in c. c.	(−) in c. c.			Raw	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated
10	1	30	30	10	10	5.5	0.93	0	100.0	55.0	9.3	0
1	.1	39	58	100	50	25	1.9	0	50.0	25.0	1.9	0
.1	.01	23	74	1,000	225	23	1.2	0	22.5	2.3	.12	0
.01	.001	2	100	10,000	505	10	2.0	1.0	5.1	.1	.02	.01
Mean.	-------	-------	66	-------	-------	-------	-------	-------	44.4	20.6	2.84	.002

Raw-water turbidity=101–500

1	0.1	58	218	100	85	48	2.6	0.48	85.0	48.0	2.6	0.48
.1	.01	130	227	1,000	381	84	3.2	.19	38.1	8.4	.32	.019
.01	.001	34	244	10,000	465	60	2.6	.24	4.7	.6	.026	.0024
.001	.0001	2	240	100,000	5,500	55	1.0	.0	5.5	.055	.001	0
Mean.	-------	-------	232	-------	-------	-------	-------	-------	44.4	14.2	.74	.125

Raw-water turbidity=over 500

1	0.1	6	595	100	100	52	2.0	0	100.0	52.0	2.0	0.0
.1	.01	24	835	1,000	440	140	3.8	.67	44.0	14.0	.38	.067
.01	.001	15	923	10,000	1,770	58	5.3	.67	17.7	.58	.053	.0067
.001	.0001	2	810	100,000	100	100	5.0	5.0	.10	.10	.005	.005
Mean.	-------	-------	791	-------	-------	-------	-------	-------	40.4	16.7	.61	.0197

LOUISVILLE, KY.

Raw-water turbidity=0–100

10	1	55	19	10	3.9	1	1.0	0.73	39.0	10.0	10.0	7.3
1	.1	46	51	100	55	43	5.4	.13	55.0	43.0	5.4	.13
.1	.01	25	68	1,000	185	65	9.8	.08	18.5	6.5	.98	.008
.01	.001	4	94	10,000	3,030	78	7.0	0	30.3	.78	.07	0
Mean.	-------	-------	58	-------	-------	-------	-------	-------	35.7	15.1	4.11	1.86

Raw-water turbidity=101–500

1	0.1	41	187	100	100	53	9.9	0.98	100.0	53.0	9.9	0.98
.1	.01	103	256	1,000	627	124	9.1	.02	62.7	12.4	.91	.002
.01	.001	27	279	10,000	1,770	187	8.0	.44	17.7	1.9	.08	.004
Mean.	-------	-------	241	-------	-------	-------	-------	-------	60.1	22.4	3.63	.329

Raw-water turbidity=over 500

1	0.1	1	650	100	-------	100	10.0	0	-------	100.0	10.0	0
.1	.01	33	764	1,000	700	187	7.3	0	70.0	18.7	.73	0
.01	.001	16	664	10,000	2,580	234	8.0	0	25.8	2.3	.08	0
.001	.0001	1	610	100,000	1,000	10	10.0	0	1.0	.01	.01	0
Mean.	-------	-------	672	-------	-------	-------	-------	-------	32.3	30.0	2.70	0

Table No. 35.—*Relations between averages of numbers of bacteria in raw water falling within specified turbidity and bacterial ranges and averages of corresponding numbers observed at various stages of treatment—Summary of group averages; raw-water turbidities 0–100, 101–500, and over 500, grouped by raw-water counts*—Continued.

C.—B. COLI INDEX—Continued

EVANSVILLE, IND.

Raw-water turbidity=0–100

B. coli in raw-water count range [6]	Number of items	Average turbidity	B. coli index per 100 c. c.			Per cent of raw-water index	
			Raw [6]	Applied	Chlorinated	Applied	Chlorinated
100–1,000	74	40	328	81	0.08	24.7	0.024
1,000–10,000	40	73	3,010	95	.45	3.2	.015
10,000–100,000	5	68	10,000	106	1.0	1.0	.010
Mean		60				9.6	.016

Raw-water turbidity=101–500

100–1,000	23	246	433	70	0.17	1.6	0.039
1,000–10,000	130	235	2,560	85	.01	3.3	.0004
10,000–100,000	51	239	10,000	98	.04	.98	.0004
Mean		240				1.96	.0133

Raw-water turbidity=over 500

1,000–10,000	23	832	2,760	76	0	2.8	0
10,000–100,000	11	804	10,000	82	0	.82	0
Mean		818				1.81	0

[6] Tests of raw water made in two samples of each dilution; hence individual index figures did not coincide with reciprocals of dilution.

HENDERSON, KY.

Raw-water turbidity=0–100

B. coli in raw water		Number of items	Average turbidity	B. coli index per 100 c. c.				Per cent of raw-water water index		
(+) in c. c.	(–) in c. c.			Raw	Applied	Filtered	Chlorinated	Applied	Filtered	Chlorinated
1	0.1	6	36	100	100	5.7	0.33	100.0	5.7	0.33
.1	.01	74	46	1,000	656	5.4	.57	65.6	.54	.057
.01	.001	5	67	10,000	4,000	6.0	.40	40.0	.06	.004
Mean			50					68.5	2.10	.130

Raw-water turbidity=101–500

1	0.1	8	172	100	78	3.5	0	78.0	3.5	0
.1	.01	69	272	1,000	641	3.7	.46	64.1	.37	.046
.01	.001	8	232	10,000	1,680	4.2	.75	16.8	.042	.0075
Mean			225					53.0	1.30	.018

Raw-water turbidity=over 500

0.1	0.01	12	646	1,000	509	0.67	0	50.9	0.067	0
Mean			646					50.9	.067	0

The nature of the bacterial relation, as indicated by the plate counts, is influenced to some extent, however, by the effect of variations in raw water turbidity, as is shown in Figure 25, plotted from the averages of the 37° C. figures given in Table No. 36, in which the mean percentages of raw water bacteria remaining in the various effluents, corresponding with raw water turbidities falling within the three stated ranges, have been transcribed from Table No. 35 B. Although a few inconsistencies are apparent in the trend of the figures for individual plants, their tendency is decidedly in the direction of lower percentages of residual bacteria coinciding with increased amounts of raw water turbidity. In Table No. 37, which has been derived by combining [19] the group averages given in Table No. 36, it further is noted that the percentages of residual bacteria corresponding to approximately equivalent numbers of raw water bacteria falling within the three different turbidity groups show a marked tendency to be lower with increased amounts of raw water turbidity.

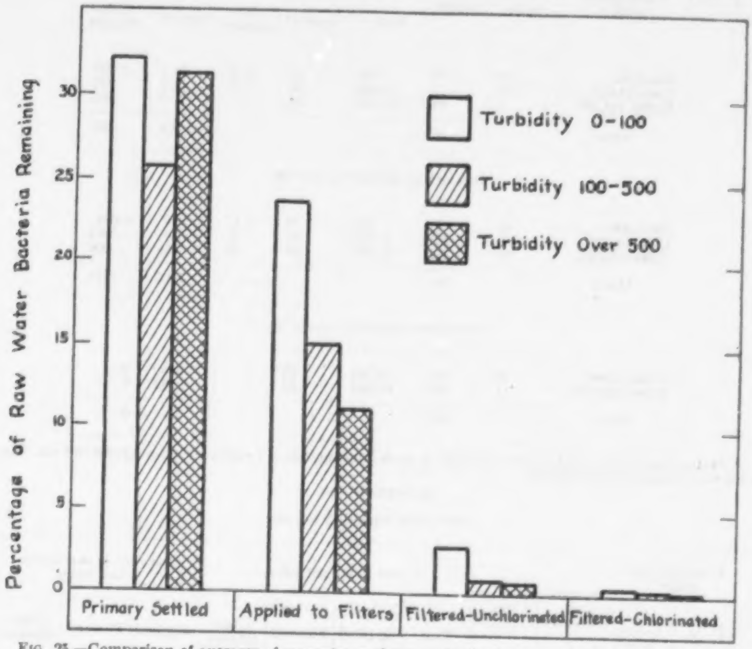

FIG. 25.—Comparison of averages of percentages of raw-water bacteria remaining in effluents from successive stages of treatment with corresponding raw-water turbidities falling within three specified ranges. (Plot of 24-hour, 37° C., count data given in Table No. 36)

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[19] The method of combining these group averages has consisted in collecting the corresponding group averages for the various plants and computing in each instance their simple arithmetical means. This procedure has been considered as preferable to that of summing and averaging the totals on which the individual group means were based, as it gives equal weight to the results observed at each plant, regardless of the number of observations in each respective group, which varied widely for the different plants.

TABLE No. 36.—*Summary of mean percentages of residual bacteria corresponding to raw-water turbidities falling within specified ranges*

[Transcribed from Table No. 35]

A. BASED ON 48-HOUR COUNT, 20° C.

	Mean percentage of raw-water bacteria remaining in—											
	Primary settled			Applied to filters			Filtered unchlorinated			Filtered chlorinated		
Raw-water turbidity	0-100	101-500	Over 500	0-100	101-500	Over 500	0-100	101-500	Over 500	0-100	101-500	Over 500
Steubenville	63.5	58.9	....	33.9	13.2	10.4	21.0	27.6	8.3	3.8	1.8	[1] 0.7
Ironton	10.0	10.4	11.0	3.3	4.2	3.0	.19	.14	.28	.05	.03	.07
Portsmouth	20.8	13.2	8.2	12.9	8.5	5.6	1.29	.82	.38	.009	.006	....
Cincinnati	33.0	22.9	26.9	25.5	15.9	3.2	3.6	3.6	.38	.69	.50	.02
Louisville	61.9	61.4	53.5	18.5	9.8	7.6	6.1	2.6	2.2	.09	.05	.04
Evansville	....	....	....	26.5	17.3	6.8	....	....	....	.62	.33	.06
Average	37.8	33.4	24.9	20.1	11.5	6.1	6.4	7.0	2.3	.88	.48	.18

B. BASED ON 24-HOUR COUNT, 37° C.

	Primary settled			Applied to filters			Filtered unchlorinated			Filtered chlorinated		
Raw-water turbidity	0-100	101-500	Over 500	0-100	101-500	Over 500	0-100	101-500	Over 500	0-100	101-500	Over 500
East Liverpool	....	....	....	26.2	16.0	8.3	8.7	1.3	1.0	0.37	0.20	0.33
Steubenville	46.7	42.9	[2] 64.0	16.4	11.0	6.1	3.7	1.0	2.0	.48	.10	.11
Huntington	....	....	....	36.5	30.0	20.5	1.2	1.0	.66	.15	.14	.12
Ashland	....	....	....	20.2	16.4	14.2	2.1	1.4	1.0	.17	.25	.12
Ironton	11.7	11.4	10.3	2.9	2.8	2.4	.20	.11	.07	.038	.030	.014
Portsmouth	22.4	16.0	14.1	13.6	9.9	8.0	.88	.20	.22	.004	.001	[3] .000
Cincinnati	47.7	32.2	36.3	35.4	9.2	10.4	3.9	.64	.59	.92	.30	.15
Louisville	....	....	....	....	....	....	....	....	....	.95	.23	.21
Evansville	....	....	....	44.1	17.1	8.5	....	....	....	.50	.16	.10
Henderson	....	....	....	16.8	22.8	21.1	1.6	1.4	.58	.13	.18	.15
Average	32.1	25.6	31.2	23.6	15.0	11.1	2.8	.88	.76	.37	.17	.13

[1] Based on a single observation. [2] Based on 2 observations. [3] Based on 9 observations.

TABLE No. 37.—*Comparison of combined average numbers and percentages of bacteria remaining in effluents from ten Ohio River plants, corresponding to given average numbers in raw water and with raw-water turbidities falling within specified ranges*

[Bacterial counts, 24 hours, 37° C.]

Raw-water count range per cubic centimeter	Raw-water turbidity		Mean bacterial count per cubic centimeter, 24 hours, 37° C.				Per cent of raw-water count remaining in—		
	Range	Mean	Raw	Applied	Filtered	Chlorinated	Applied	Filtered	Chlorinated
0-500	0-100	52	237	63	4.2	0.84	26.6	1.8	0.35
	101-500	216	298	55	4.0	.76	18.5	1.3	.26
	Over 500	(¹)	....	....	....	....	....	....	....
501-1,000	0-100	49	858	251	25.0	3.0	28.2	2.8	.35
	101-500	215	830	118	4.9	1.1	14.2	.59	.13
	Over 500	858	762	77	1.8	.8	10.1	.24	.15
1,001-2,000	0-100	57	1,480	409	4.3	3.7	27.6	2.9	.25
	101-500	238	1,470	182	7.9	1.5	12.4	.54	.10
	Over 500	1,000	1,590	91	1.7	.66	5.7	.11	.04
2,001-3,000	0-100	50	2,400	472	66.0	5.9	19.7	2.8	.24
	101-500	234	2,550	328	24.0	8.7	12.7	.94	.34
	Over 500	813	2,590	349	11.0	1.9	13.5	.42	.07
3,001-5,000	0-100	46	3,450	730	30.0	6.2	21.2	.87	.18
	101-500	270	3,720	471	22.0	3.4	12.7	.59	.09
	Over 500	842	4,180	232	15.0	3.4	5.6	.36	.08
Over 5,000	0-100	80	9,410	1,470	70.0	5.4	15.6	.74	.06
	101-500	265	10,600	1,300	86.0	8.1	12.3	.81	.08
	Over 500	918	10,100	1,100	30.0	4.2	11.5	.30	.04

[1] No observations available.

The data given in Table No. 35 C indicate, however, that the efficiency of removal of *B. coli* was not affected by turbidity variations to any marked extent or in any orderly manner, as was true of the bacteria enumerated in the plate counts. This point is brought out more clearly by the figures in Table No. 38, which have been derived by combing the data of Table No. 35 C, for the three groups corresponding to raw-water *B. coli* indices of 100, 1,000 and 10,000 *B. coli* per 100 cubic centimeters, respectively. In this table the efficiency of *B. coli* removal is shown to be affected to a much greater extent by variations in the density of *B. coli* in the raw water than by variations in raw-water turbidity.

TABLE NO. 38.—*Comparison of combined average numbers and percentages of B. coli remaining in effluents from 10 Ohio River plants, corresponding to given average numbers in raw water and with raw-water turbidities falling within specified ranges*

B. coli index per 100 c. c. raw water	Raw-water turbidity		B. coli index per 100 c. c.			Per cent of raw-water index remaining in—		
	Range	Mean	Applied	Filtered	Chlorinated	Applied	Filtered	Chlorinated
100	0–100	48	52	2.8	0.23	52.0	2.8	0.23
	101–500	208	49	3.4	.41	49.0	3.4	.41
	Over 500	771	72	2.5	.00	72.0	2.5	.00
1,000	0–100	61	226	3.5	.28	22.6	.35	.028
	101–500	234	278	4.2	.31	27.8	.42	.031
	Over 500	774	226	3.4	.20	22.6	.34	.020
10,000	0–100	74	1,260	4.2	.64	12.6	.042	.0064
	101–500	251	1,070	3.4	.42	10.7	.034	.0042
	Over 500	925	1,110	4.7	.43	11.1	.047	.0043

The question as to how far the effect of changes in raw-water turbidity on the efficiency of removal of bacteria enumerated in the plate count may be due to the fact that the amounts of coagulating chemicals added to the water usually are varied directly in accordance with such turbidity changes would require a more elaborate analysis of the data than is permissible within the compass of this report. That these variations in coagulant dosage are responsible in no small measure for the differences in bacterial efficiency observed is suggested, at least, by the fact that the variation in the average percentages of residual bacteria coincident with changes in raw-water turbidity was considerably less at the Ironton and Huntington plants, where more nearly constant amounts of coagulants were used, than at the other plants of the Ohio River Group. (See Table No. 35.)

From these considerations it appears that the efficiency of removal of both the 20° C. and 37° C. bacterial growers is influenced to a measurable extent by variations in the turbidity of the raw water but that this statement does not apply equally to the *B. coli*. In all three instances, however, the influence of turbidity variations is overshadowed, to a large extent, by the tendency of all of the plants to produce effluents of higher bacterial content coincidentally with increased numbers of bacteria in the raw water. In view of this circumstance, the primary classification of the data according to raw-water turbidity, as shown in Table No. 35, is, for all practical purposes, nonessential to the development of basic curves showing the primary bacterial relationships involved. This is especially true of the *B. coli* relations, which are of greatest importance in respect to their application to the problem at hand.

In order to simplify, accordingly, the statistical treatment of the data, the bacteriological figures presented in the foregoing series of tables were regrouped, omitting the primary turbidity classification, with results as shown in Table No. 39, which have been derived by combining the data for the three turbidity classes as given in Table No. 35, and averaging their totals. In the right-hand columns of these tables are tabulated the corresponding percentages of residual bacteria, referred, respectively, to the raw-water count and to the influent-water count at each successive stage of purification.

TABLE No. 39.—*Results obtained by regrouping, irrespective of raw-water turbidity, the data summarized in Table No. 35*

A. 48-HOUR AGAR COUNT, 20° C.

Raw-water count range	Number of items	Average turbidity	Average bacterial count per cubic centimeter					Per cent of raw count				Per cent of influent			
			Raw	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated
STEUBENVILLE															
0-100	7	25	67	53	31	21.0	0.5	79.1	46.3	31.3	0.75	79.1	58.5	67.7	2.4
101-250	14	33	195	102	69	47.0	19.0	52.3	35.4	24.1	9.7	52.3	67.6	68.1	40.4
251-500	16	30	404	258	144	104.0	32.0	64.9	35.6	25.7	7.9	63.9	55.8	72.2	30.8
501-1,500	30	42	968	707	249	153.0	20.0	73.0	25.7	15.8	2.1	73.0	35.2	61.4	13.1
Over 1,500	54	129	3,240	2,050	631	257.0	62.0	63.3	19.5	7.9	1.9	63.3	30.8	40.7	24.1
IRONTON															
0-2,500	21	81	2,080	254	85	5.2	2.0	12.2	4.1	0.25	0.006	12.2	33.5	6.1	38.5
2,501-5,000	44	195	4,080	432	144	5.4	1.8	10.6	3.5	.13	.044	10.6	33.3	3.8	33.3
5,001-10,000	63	267	7,590	978	284	18.0	2.5	12.9	3.7	.24	.033	12.9	20.0	6.3	13.9
Over 10,000	150	283	32,600	2,760	743	44.0	4.2	8.5	2.3	.13	.013	8.5	26.9	5.9	9.5
PORTSMOUTH															
0-1,500	53	29	1,160	374	262	25.0	0.15	32.2	22.6	2.2	0.013	32.2	70.0	9.5	0.60
1,501-2,500	41	28	1,980	583	314	39.0	.24	29.4	15.9	2.0	.012	29.4	53.9	12.4	.62
2,501-5,000	80	97	3,860	758	481	46.0	.33	19.6	12.5	1.2	.009	19.6	63.5	9.6	.72
5,001-10,000	94	165	7,580	1,090	667	60.0	.65	14.4	8.8	.79	.009	14.4	61.2	9.0	1.1
10,001-20,000	49	283	14,600	1,670	1,030	99.0	.65	11.4	7.1	.68	.004	11.4	61.7	9.6	.66
Over 20,000	49	291	35,900	3,510	2,090	202.0	1.40	9.8	5.8	.56	.039	9.8	59.5	9.7	.09
CINCINNATI															
0-250	25	39	142	226	129	19.0	3.1	100.0+	90.8	13.4	2.2	100.0+	57.1	14.7	16.3
251-500	29	60	381	269	113	16.0	3.8	70.6	20.7	4.2	1.0	70.6	42.0	14.2	23.8
501-2,500	77	141	1,450	555	180	14.0	2.9	38.3	12.4	.97	.2	38.3	32.4	7.8	20.7
2,501-10,000	103	319	5,430	1,400	247	27.0	2.7	25.8	4.6	.50	.050	25.8	17.6	10.9	10.0
10,001-50,000	89	327	24,700	4,560	819	122.0	4.5	18.5	3.3	.49	.018	18.5	18.0	14.9	3.7
Over 50,000	42	446	88,800	8,110	1,190	184.0	2.5	9.1	1.3	.21	.003	9.1	14.7	15.6	1.4
LOUISVILLE															
0-1,000	12	37	631	1,100	500	359.0	9.2	100.0+	79.2	56.9	1.4	100.0+	45.4	71.8	2.6
1,001-10,000	116	176	9,490	3,440	1,220	150.0	6.7	36.2	12.9	1.6	.070	36.2	35.5	12.3	4.5
10,001-25,000	100	323	16,830	10,500	1,730	401.0	9.1	62.3	10.3	2.4	.054	62.3	16.4	23.2	2.3
Over 25,000	97	494	40,800	18,700	2,370	971.0	14.2	45.8	5.8	2.4	.034	45.8	12.7	41.0	1.5

EVANSVILLE

0-500	26	19	446	....	142	....	4.5	....	31.8	....	1.0	....	31.8	....	3.2
501-1,000	45	54	827	....	260	....	6.4	....	31.4	....	.77	....	31.4	....	2.5
1,001-2,000	44	123	1,710	....	459	....	5.6	....	26.8	....	.33	....	26.8	....	1.2
2,001-3,500	34	207	2,760	....	497	....	6.4	....	18.0	....	.23	....	18.0	....	1.3
Over 3,500	219	316	24,900	....	2,140	....	3.5	....	8.6	....	.014	....	8.6	....	.16

TABLE No. 39B.—*Results obtained by regrouping, irrespective of raw-water turbibidity, the data summarized in Table No. 35*

B. 24-HOUR AGAR COUNT, 37° C.

EAST LIVERPOOL

Raw-water count range	Number of items	Average turbidity	Average bacterial count per cubic centimeter					Per cent of raw count				Per cent of influent			
			Raw	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated
0-500	53	69	283	....	104	39.0	1.1	....	36.8	13.8	0.39	....	36.8	37.5	2.8
500-1,000	40	73	780	....	164	54.0	1.9	....	21.0	6.9	.24	....	21.0	32.9	3.5
1,001-2,000	55	157	1,610	....	460	114.0	5.9	....	28.6	7.1	.36	....	28.6	24.8	5.1
2,001-3,000	52	162	2,590	....	510	83.0	15.0	....	19.7	3.2	.58	....	19.7	16.3	1.8
3,001-5,000	59	224	4,070	....	857	178.0	15.0	....	21.1	4.4	.37	....	21.1	20.8	8.4
Over 5,000	77	262	11,700	....	1,630	495.0	42.0	....	13.9	4.2	.36	....	13.9	30.4	8.5

STEUBENVILLE

Raw-water count range	Number of items	Average turbidity	Raw	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated
0-100	118	25	49	35	11	2.2	0.64	71.4	22.4	4.5	1.3	71.4	31.4	20.0	29.1
101-250	74	38	160	85	20	4.8	.74	53.1	12.5	3.0	.46	53.1	23.5	24.0	15.4
251-500	48	80	360	165	83	15.0	.42	45.8	23.1	4.2	.12	45.8	50.3	18.1	2.8
501-1,500	41	54	963	321	122	28.0	1.1	33.3	12.7	2.9	.11	33.3	38.0	22.9	3.9
Over 1,500	45	100	3,640	1,310	250	34.0	1.9	36.0	6.9	.93	.05	36.0	19.1	13.6	5.6

HUNTINGTON

Raw-water count range	Number of items	Average turbidity	Raw	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated
0-500	87	98	259	....	90	4.0	0.79	....	34.7	1.5	0.31	....	34.7	4.4	19.8
501-1,000	76	153	836	....	260	11.0	1.5	....	31.1	1.3	.18	....	31.1	4.2	13.6
1,001-2,000	69	232	1,550	....	515	17.0	2.1	....	33.2	1.1	.14	....	33.2	3.3	12.4
2,001-5,000	65	315	3,470	....	1,030	29.0	2.0	....	29.7	.84	.058	....	29.7	2.8	6.9
Over 5,000	9	624	7,220	....	2,270	61.0	2.8	....	31.4	.84	.039	....	31.4	2.7	4.6

Table No. 39B.—Continued

B.—24-HOUR AGAR COUNT, 37° C.—Continued

Raw-water count range	Number of items	Average turbidity	Average bacterial count per cubic centimeter					Per cent of raw count				Per cent of influent			
			Raw	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated
ASHLAND															
0-250	24	230	166	----------	57	5.3	0.71	----------	34.3	3.2	0.43	----------	34.3	9.3	13.4
251-500	69	301	368	----------	77	7.2	1.3	----------	20.9	1.9	.35	----------	20.9	9.3	18.0
501-1,000	101	322	763	----------	120	9.5	1.0	----------	15.7	1.2	.13	----------	15.7	7.9	10.5
1,001-2,000	96	443	1,420	----------	154	16.0	.95	----------	10.8	1.1	.067	----------	10.8	10.4	5.9
Over 2,000	27	471	3,320	----------	156	12.0	.59	----------	4.7	.36	.018	----------	4.7	7.7	4.9
IRONTON															
0-2,500	123	196	1,600	181	49	2.1	0.53	11.3	3.1	0.13	0.033	11.3	27.1	4.3	25.2
2,501-5,000	93	291	3,640	399	117	5.2	1.8	11.0	3.2	.14	.049	11.0	29.3	4.4	34.6
5,001-10,000	41	280	7,080	678	179	9.0	1.8	9.6	2.5	.13	.025	9.6	26.4	5.0	20.0
Over 10,000	17	342	20,000	2,630	469	29.0	3.7	13.2	2.3	.14	.018	13.2	17.8	6.2	12.8
PORTSMOUTH															
0-500	81	79	337	55	27	0.26	0	16.3	8.0	0.077	0.00	16.3	49.1	0.96	0
501-1,000	128	123	795	161	102	3.9	.008	20.3	12.8	.49	.001	20.3	63.4	3.8	.2
1,001-1,500	64	117	1,300	377	213	14.0	.047	29.0	16.4	1.08	.004	29.0	56.5	6.6	.34
1,501-3,000	62	216	2,190	448	276	14.0	.081	20.5	12.6	.64	.004	20.5	61.6	5.1	.58
Over 3,000	31	354	4,720	628	435	21.0	.065	13.3	9.2	.44	.001	13.3	60.3	4.8	.31
CINCINNATI															
0-100	89	129	66	50	19	3.6	0.64	75.8	28.8	5.5	0.97	75.8	38.0	19.0	17.8
101-250	65	151	163	48	25	2.8	1.2	29.4	15.3	1.7	.74	29.4	52.1	11.2	42.9
251-500	57	226	374	129	54	3.3	1.4	34.5	14.4	.88	.37	34.5	41.9	6.1	42.4
501-1,000	47	254	721	201	95	4.4	1.8	27.9	13.2	.61	.25	27.9	47.3	4.6	40.9
1,001-2,500	66	374	1,530	425	106	7.3	2.6	27.8	6.9	.48	.17	27.8	24.9	6.9	35.6
Over 2,500	34	646	5,180	903	233	30.0	5.7	17.4	4.5	.58	.11	17.4	25.8	12.9	19.0

EVANSVILLE

0-1,000	38	82	891	----------	233	----------	5.6	----------	26.2	----------	0.63	----------	----------	----------	----------
1,001-1,500	41	119	1,350	----------	335	----------	5.7	----------	24.8	----------	.42	----------	----------	----------	----------
1,501-2,000	40	145	1,870	----------	653	----------	7.4	----------	34.9	----------	.40	----------	----------	----------	----------
2,001-5,000	156	237	3,320	----------	588	----------	7.2	----------	17.7	----------	.22	----------	----------	----------	----------
Over 5,000	89	379	10,700	----------	1,050	----------	8.2	----------	9.8	----------	.077	----------	----------	----------	----------

HENDERSON

0-2,500	53	133	1,940	----------	582	39.0	5.1	----------	30.0	2.0	0.26	----------	30.0	6.7	13.1
2,501-3,500	46	136	3,080	----------	783	41.0	6.3	----------	25.4	1.3	.20	----------	25.4	5.2	15.4
3,501-5,000	41	208	4,240	----------	937	55.0	7.4	----------	22.1	1.3	.17	----------	22.1	5.9	13.5
5,001-7,500	16	323	6,000	----------	1,010	103.0	8.7	----------	16.8	1.7	.15	----------	16.8	10.2	8.4
7,501-10,000	11	305	8,820	----------	1,180	99.0	5.6	----------	13.4	1.1	.063	----------	13.4	8.4	5.7
Over 10,000	17	237	19,800	----------	2,980	245.0	23.0	----------	15.0	1.2	.12	----------	15.0	8.2	9.4

TABLE No. 39C

C.—B. COLI INDEX

EAST LIVERPOOL

Raw-water index	Number of items	Average B. coli index per 100 c. c.					Per cent of raw-water index				Per cent of influent-water index			
		Raw	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated
10	54	10	----------	7.9	2.6	1.2	----------	79.0	26.0	12.0	----------	79.0	32.9	46.2
100	91	100	----------	68.0	3.6	1.9	----------	68.0	3.6	1.9	----------	68.0	5.3	52.7
1,000	81	1,000	----------	544.0	5.4	2.3	----------	54.4	.54	.23	----------	54.4	.99	42.6
10,000	56	10,000	----------	3,050.0	6.8	3.9	----------	3.0	.06	.03	----------	3.0	.22	57.2
100,000	2	100,000	----------	1,000.0	10.0	7.0	----------	1.0	.01	.007	----------	1.0	1.0	70.0

STEUBENVILLE

10	121	10	6.3	6.4	0.45	0.18	63.0	64.0	4.5	1.8	63.0	100.0+	7.0	40.0
100	82	100	44.0	23.0	.76	.20	44.0	23.0	.76	.20	44.0	52.3	3.3	26.0
1,000	25	1,000	460.0	210.0	9.6	.72	46.0	21.0	.96	.07	46.0	45.7	4.6	7.5
10,000	7	10,000	3,700.0	1,000.0	2.9	1.1	37.0	10.0	.03	.01	37.0	27.0	.29	38.0

Table No. 39C—Continued

C.—B. COLI INDEX—Continued

Raw-water index	Number of items	Average B. coli index per 100 c. c.					Per cent of raw water index				Per cent of influent-water index			
		Raw	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated
ASHLAND														
100	23	100	....	60.0	2.4	0	....	60.0	2.4	0	....	60.0	4.0	0
1,000	162	1,000	....	258.0	3.5	.11	....	25.8	.35	.01	....	25.8	1.4	3.1
10,000	100	10,000	....	2,560.0	4.0	.12	....	25.6	.04	.001	....	25.6	.16	3.0
100,000	24	100,000	....	2,610.0	2.4	0	....	2.6	.002	0	....	2.6	.09	0
IRONTON														
1,000	37	1,000	146.0	95.0	3.6	0	14.6	9.5	0.37	0	14.6	65.1	3.75	0
10,000	74	10,000	748.0	99.0	.6	.02	7.4	1.0	.006	.0002	7.4	13.2	.60	3.3
12,500	84	12,500	1,440.0	147.0	1.1	.05	11.5	1.2	.09	.0004	11.5	10.2	.75	4.5
16,700	67	16,700	1,860.0	207.0	1.8	.2	11.1	1.2	.01	.001	11.1	11.1	.87	11.1
33,300	30	33,300	2,240.0	202.0	2.8	.1	6.7	.7	.08	.0003	6.7	9.0	1.38	3.6
PORTSMOUTH														
100	9	100	70.0	20.0	0.5	0	70.0	20.0	0.5	0	70.0	28.6	2.5	0
1,000	268	1,000	213.0	62.0	1.5	0	21.3	6.2	.15	0	21.3	29.1	2.4	0
10,000	89	10,000	604.0	107.0	1.0	0	6.4	1.07	.01	0	6.4	17.6	.93	0
CINCINNATI														
100	97	100	70.0	63.0	5.1	0.29	70.0	63.0	5.1	0.29	70.0	9.0	8.1	5.7
1,000	178	1,000	360.0	129.0	6.2	.2	36.0	12.9	.62	.02	36.0	35.8	4.8	3.4
10,000	56	10,000	749.0	106.0	8.4	.4	7.5	1.0	.08	.004	7.5	14.2	7.9	4.8
100,000	5	100,000	2,260.0	224.0	4.0	2.0	2.3	.22	.004	.002	2.3	9.9	1.8	50.0

LOUISVILLE															
10	56	10	6.5	2.2	2.1	0.07	65.0	22.0	21.0	0.7	65.0	33.9	95.6	3.3
100	86	100	74.0	49.0	11.0	.12	74.0	49.0	11.0	.12	74.0	66.2	22.4	1.1
1,000	161	1,000	628.0	136.0	22.0	.02	62.8	13.6	2.2	.003	62.8	21.7	16.2	.11
10,000	47	10,000	2,150.0	191.0	7.9	.26	21.5	1.9	.08	.003	21.5	8.9	4.1	3.3
100,000	1	100,000	1,000.0	10.0	10.0	.00	1.0	.01	.01	0	1.0	1.0	100.0	0
EVANSVILLE															
0-99	3	50	----------	67.0	----------	0	----------	100.0+	----------	0	----------	100.0+	----------	0
100	94	352	----------	79.0	----------	.11	----------	22.0	----------	.03	----------	22.0	----------	.14
1,000	202	2,680	----------	85.0	----------	.10	----------	3.2	----------	.004	----------	3.2	----------	.12
10,000	67	10,000	----------	93.0	----------	.09	----------	.9	----------	.001	----------	.9	----------	.01
HENDERSON															
100	14	100	----------	87.0	4.4	0.14	----------	87.0	4.4	0.14	----------	87.0	5.1	3.2
1,000	155	1,000	----------	638.0	4.3	.48	----------	63.8	.43	.05	----------	63.8	.67	11.2
10,000	13	10,000	----------	2,310.0	4.0	.46	----------	23.1	.04	.005	----------	23.1	.17	11.5

In the three tables thus presented, further evidence is consistently shown, in the case of every individual plant, of the relationship as existing between the bacterial quality of the raw water and that of the effluent from each stage of purification. In these tables it is noted that a more decided tendency exists toward a progressive decrease in the percentages of residual bacteria, accompanying increasing numbers of bacteria in the raw water, than was apparent in Table No. 35. This is due largely to the fact that the turbidity and the bacterial content of Ohio River water tend to vary concurrently in similar directions, thereby intensifying the effect which variations in each one separately exert on the efficiency of bacterial removal.

In Table No. 40, which is divided into three sections, designated as A, B, and C, are tabulated the results obtained from grouping and averaging the 20° C. and 37° C. plate-count data for each plant separately, according to the counts observed, respectively, in the primary settled water (for Group I plants only), in the water as applied to the filters, and in the unchlorinated filter effluent, the method followed being the same as previously described. In every instance correlation existing between the bacterial quality of the influent water and that of the effluents produced at succeeding stages of treatment is consistently shown. The corresponding percentages of residual bacteria, though irregular in their trend in a number of cases, display a decided tendency toward a progressive diminution with increasing numbers of bacteria in the influent water to each successive stage.

TABLE No. 40.—*Relations between averages of numbers of bacteria in primary settled water falling within specified ranges and averages of corresponding numbers observed in effluents from subsequent stages of treatment*

A. SUMMARY OF GROUP AVERAGES, ALL TURBIDITIES, GROUPED BY PRIMARY SETTLED WATER COUNTS

Forty-eight-hour agar count, 20° C.

STEUBENVILLE

Settled water-count range	Number of items	Average bacterial count per cubic centimeter				Per cent of settled-water count		
		Settled	Applied	Filtered	Chlorinated	Applied	Filtered	Chlorinated
0-250	21	166	48	22.0	19.0	28.8	13.2	11.4
251-500	20	389	132	73.0	10.0	33.9	18.8	2.6
501-1,000	19	715	266	135.0	36.0	37.2	18.9	5.0
Over 1,000	61	2,960	578	309.0	66.0	19.5	10.4	2.2

IRONTON

Settled water-count range	Number of items	Settled	Applied	Filtered	Chlorinated	Applied	Filtered	Chlorinated
0-250	28	191	92	3.4	1.7	48.2	1.8	0.89
251-500	49	412	151	6.6	2.2	36.8	1.6	.53
501-1,000	64	803	273	11.0	1.8	34.0	1.4	.22
1,001-2,000	62	1,480	470	23.0	2.8	31.7	1.6	.19
2,001-5,000	57	3,280	827	58.0	5.5	25.2	1.8	.17
Over 5,000	21	7,660	1,760	127.0	6.2	23.0	1.7	.081

Table No. 40.—*Relations between averages of numbers of bacteria in primary settled water falling within specified ranges and averages of corresponding numbers observed in effluents from subsequent stages of treatment*—Continued

A. SUMMARY OF GROUP AVERAGES, ALL TURBIDITIES, GROUPED BY PRIMARY SETTLED WATER COUNTS—Continued

Forty-eight-hour agar count, 20° C.—Continued

PORTSMOUTH

Settled water-count range	Number of items	Average bacterial count per cubic centimeter				Per cent of settled-water count		
		Settled	Applied	Filtered	Chlorinated	Applied	Filtered	Chlorinated
0-300	48	241	169	23.0	0.23	70.1	9.5	0.095
301-500	56	436	294	26.0	.20	67.3	6.0	.049
501-750	52	653	427	29.0	.13	65.4	4.4	.020
751-1,500	109	1,090	685	60.0	.45	62.9	5.5	.041
1,501-2,500	54	2,000	1,130	133.0	1.6	56.5	6.6	.080
Over 2,500	39	4,110	2,310	209.0	1.0	56.1	5.1	.024
CINCINNATI								
0-250	62	147	105	11.0	8.0	71.4	7.5	5.4
251-500	40	382	129	16.0	2.8	33.7	4.2	.73
501-1,000	84	767	183	15.0	2.2	23.8	2.0	.29
1,001-5,000	126	3,380	645	90.0	6.7	19.1	2.7	.20
Over 5,000	45	9,540	1,310	210.0	2.7	13.7	2.1	.028
LOUISVILLE								
0-2,500	76	1,360	677	149.0	10.4	49.8	10.9	0.76
2,501-10,000	133	5,540	1,470	391.0	6.1	26.5	7.1	.11
10,001-16,500	61	12,900	1,830	550.0	11.0	14.2	4.2	.085
Over 16,500	50	25,800	2,840	3,040.0	28.0	11.0	11.8	.11

Twenty-four-hour agar count, 37° C.

Settled water-count range	Number of items	Settled	Applied	Filtered	Chlorinated	Applied	Filtered	Chlorinated
STEUBENVILLE								
0-50	118	28	9.4	1.4	0.51	33.6	5.0	1.8
51-100	74	78	20.0	9.4	.67	25.6	12.1	.86
101-300	69	183	38.0	11.0	.85	20.8	6.0	.46
Over 300	71	1,370	259.0	41.0	1.8	18.9	3.0	.14
IRONTON								
0-250	133	155	56.0	2.4	0.81	36.2	1.5	0.52
251-500	75	377	93.0	5.4	1.5	24.7	1.4	.40
501-1,000	45	726	166.0	8.0	1.8	22.8	1.1	.25
1,001-2,000	9	1,400	297.0	14.0	3.9	21.2	1.0	.28
Over 2,000	9	3,640	604.0	29.0	3.1	16.6	.8	.085
PORTSMOUTH								
0-100	140	61	33.0	0.62	0	54.0	1.0	0
101-250	78	188	111.0	3.3	.03	59.1	1.8	.016
251-500	95	375	244.0	15.0	.06	65.0	4.0	.016
Over 500	45	798	478.0	21.0	.04	60.0	2.6	.005
CINCINNATI								
0-100	173	47	18.0	2.5	0.57	38.2	5.3	1.2
101-250	94	170	68.0	5.7	2.7	40.0	3.4	1.6
251-1,000	76	508	149.0	9.5	9.6	29.2	1.9	1.9
Over 1,000	12	1,820	403.0	58.0	16.0	22.2	3.2	.88

Table No. 40.—*Relations between averages of numbers of bacteria in primary settled water falling within specified ranges and averages of corresponding numbers observed in effluents from subsequent stages of treatment*—Continued

B. SUMMARY OF GROUP AVERAGES, ALL TURBIDITIES, GROUPED BY APPLIED WATER COUNTS

Forty-eight-hour agar count, 20° C.

Applied water-count range	Number of items	Average bacterial count per cubic centimeter			Per cent of applied water count	
		Applied	Filtered	Chlorinated	Filtered	Chlorinated
STEUBENVILLE						
0-100	23	47	15.0	3.7	32.0	7.9
101-250	31	182	66.0	7.6	37.2	4.2
251-500	26	388	142.0	47.0	36.6	12.1
Over 500	41	979	481.0	111.0	49.2	11.3
IRONTON						
0-100	63	74	4.3	1.7	5.8	2.3
101-250	70	164	9.8	1.6	6.0	.98
251-500	58	387	23.0	3.7	5.9	.96
Over 500	92	1,100	64.0	4.7	5.8	.43
PORTSMOUTH						
0-250	71	173	21.0	0.24	12.1	0.14
251-500	118	398	32.0	.25	8.0	.063
501-1,000	103	811	72.0	.53	8.9	.065
Over 1,000	74	1,910	191.0	1.3	10.0	.068
CINCINNATI						
0-50	33	34	3.3	1.7	9.7	5.0
51-100	75	78	13.0	7.7	16.6	1.0
101-250	103	171	15.0	3.5	8.8	.20
251-500	54	365	51.0	5.5	14.0	.15
Over 500	101	1,230	179.0	2.5	14.6	.020
LOUISVILLE						
0-900	81	555	126.0	7.3	22.7	1.3
901-1,500	71	1,260	288.0	6.7	22.8	.53
1,501-2,300	64	1,910	568.0	12.6	29.7	.66
Over 2,300	51	3,340	859.0	12.0	25.7	.36
EVANSVILLE						
0-150	44	98	----------	4.7	----------	4.8
151-250	54	213	----------	4.3	----------	2.0
251-500	84	384	----------	4.0	----------	1.0
501-1,500	93	889	----------	5.8	----------	.65
Over 1,500	90	4,330	----------	3.6	----------	.08

Twenty-four-hour agar count, 37° C.

Applied water-count range	Number of items	Average bacterial count per cubic centimeter			Per cent of applied water count	
		Applied	Filtered	Chlorinated	Filtered	Chlorinated
EAST LIVERPOOL						
0-100	73	48.0	5.6	1.0	11.7	2.1
101-250	69	178.0	33.0	2.0	18.5	1.1
251-500	57	374.0	80.0	2.8	21.4	.75
501-1,000	55	793.0	229.0	13.0	28.9	1.6
1,001-2,000	46	1,430.0	310.0	25.0	21.7	1.7
Over 2,000	29	3,160.0	810.0	84.0	25.7	2.8

TABLE No. 40.—*Relations between averages of numbers of bacteria in primary settled water falling within specified ranges and averages of corresponding numbers observed in effluents from subsequent stages of treatment*—Continued

B. SUMMARY OF GROUP AVERAGES, ALL TURBIDITIES, GROUPED BY APPLIED WATER COUNTS—Continued

Twenty-four-hour agar count, 37° C.—Continued

STEUBENVILLE

Applied water-count range	Number of items	Average bacterial count per cubic centimeter			Per cent of applied water count	
		Applied	Filtered	Chlorinated	Filtered	Chlorinated
0-5	83	3.1	0.9	0.26	29.0	8.4
6-10	63	7.8	2.3	.49	29.5	6.3
11-25	66	17.0	4.4	.53	25.9	3.1
26-100	70	47.0	8.7	1.4	18.5	3.0
Over 100	48	393.0	64.0	4.8	16.3	2.6
HUNTINGTON						
0-150	102	79.0	3.3	0.78	4.2	0.99
151-300	61	247.0	11.0	1.6	4.4	.64
301-500	55	425.0	16.0	1.8	3.8	.42
501-1,000	58	807.0	25.0	2.4	3.1	.30
Over 1,000	31	1,870.0	49.0	2.2	2.6	.12
ASHLAND						
0-25	32	17.0	2.5	0.59	14.7	3.5
26-50	72	40.0	4.8	.60	12.0	1.5
51-100	83	76.0	6.1	1.1	8.0	1.4
101-150	53	127.0	12.0	1.1	9.4	.86
Over 150	74	285.0	24.0	1.4	8.4	.49
IRONTON						
0-100	186	56	2.9	0.98	5.2	1.7
101-250	71	168	6.8	2.0	4.0	1.2
Over 250	19	604	30.0	2.1	5.0	3.5
PORTSMOUTH						
0-50	132	29	0.2	0	0.69	0
51-100	64	84	2.6	0	3.1	0
101-200	67	166	8.0	.06	4.8	.048
201-300	45	261	15.0	.04	5.7	.015
Over 300	58	486	25.0	.05	5.1	.010
CINCINNATI						
0-25	170	12	1.7	1.3	14.2	10.8
26-50	67	39	3.1	1.6	8.0	4.1
51-100	62	73	7.0	3.6	9.6	4.9
Over 100	56	297	26.0	11.2	8.8	3.0
EVANSVILLE						
0-150	57	112	....	3.8	....	3.4
151-250	78	208	....	4.4	....	2.1
251-500	88	375	....	6.1	....	1.6
501-1,200	85	892	....	9.7	....	1.1
Over 1,200	58	2,040	....	12.0	....	.59
HENDERSON						
0-500	46	376	47.5	8.3	12.6	2.2
501-750	42	646	28.2	5.2	4.2	.8
751-1,000	49	896	54.4	6.5	6.1	.72
Over 1,000	39	2,180	158.0	12.2	7.2	.56

TABLE No. 40.—*Relations between averages of numbers of bacteria in primary settled water falling within specified ranges and averages of corresponding numbers observed in effluents from subsequent stages of treatment*—Continued

C. SUMMARY OF GROUP AVERAGES, ALL TURBIDITIES, GROUPED BY UNCHLORINATED FILTER EFFLUENT COUNTS

Forty-eight-hour agar count, 20° C.

STEUBENVILLE

Filtered water-count range	Number of items	Average bacterial count per cubic centimeter		Per cent of filtered water count, chlorinated
		Filtered	Chlorinated	
0–25	29	8.9	1.5	16.9
26–100	33	53.0	9.0	17.0
101–300	27	222.0	26.0	11.7
Over 300	32	707.0	149.0	21.1

IRONTON

Filtered water-count range	Number of items	Filtered	Chlorinated	Per cent of filtered water count, chlorinated
0–5	94	2.8	1.5	53.6
6–10	47	8.4	2.1	25.0
11–25	53	17.7	3.3	18.6
Over 25	70	95.0	6.1	6.4

PORTSMOUTH

Filtered water-count range	Number of items	Filtered	Chlorinated	Per cent of filtered water count, chlorinated
0–15	95	9.0	0.02	0.11
16–30	69	24.0	.01	.042
31–75	90	49.0	.17	.35
76–150	57	108.0	.77	.71
Over 150	56	246.0	2.5	1.0

CINCINNATI

Filtered water-count range	Number of items	Filtered	Chlorinated	Per cent of filtered water count, chlorinated
0–5	111	2.6	8.7	100.0+
6–10	36	7.8	4.1	52.5
11–25	59	17.0	6.3	37.1
26–100	76	58.0	3.6	6.2
Over 100	84	208.0	3.3	1.6

LOUISVILLE

Filtered water-count range	Number of items	Filtered	Chlorinated	Per cent of filtered water count, chlorinated
0–175	122	90.0	5.9	6.0
176–500	85	290.0	7.8	2.7
501–1,100	63	775.0	13.0	1.7
Over 1,100	59	4,050.0	28.0	.69

Twenty-four-hour agar count, 37° C.

EAST LIVERPOOL

Filtered water-count range	Number of items	Filtered	Chlorinated	Per cent of filtered water count, chlorinated
0–5	72	2.4	0.68	28.3
6–25	57	14.0	2.1	15.0
26–75	51	48.0	3.4	7.1
76–200	61	135.0	9.3	6.9
Over 200	79	623.0	38.0	6.1

STEUBENVILLE

Filtered water-count range	Number of items	Filtered	Chlorinated	Per cent of filtered water count, chlorinated
0	77	0	0.31	100.0+
1	75	1.0	.38	38.0
2–5	87	3.0	.78	26.0
Over 5	96	126.0	3.1	2.5

Table No. 40.—*Relations between averages of numbers of bacteria in primary settled water falling within specified ranges and averages of corresponding numbers observed in effluents from subsequent stages of treatment*—Continued

C. SUMMARY OF GROUP AVERAGES, ALL TURBIDITIES,, GROUPED BY UNCHLORINATED FILTER EFFLUENT COUNTS—Continued

Twenty-four-hour agar count, 37° C.—Continued

Filtered water-count range	Number of items	Average bacterial count per cubic centimeter		Per cent of filtered water count, chlorinated
		Filtered	Chlorinated	
HUNTINGTON				
0-5	111	2.6	0.66	25.4
6-10	62	8.1	1.5	18.5
11-25	75	17.0	2.1	12.4
Over 25	60	45.0	2.7	6.0
ASHLAND				
0-1	84	0.43	0.30	69.7
2-4	92	2.9	.94	31.4
5-10	69	6.9	1.3	18.9
Over 10	71	37.0	1.4	3.8
IRONTON				
0-1	77	0.58	0.95	100.0+
2-4	61	2.7	1.2	44.5
5-10	59	7.4	3.9	53.7
Over 10	30	33.0	3.8	11.5
PORTSMOUTH				
0	184	0	0	0
1-5	71	2.3	0	0
6-20	54	12.0	.02	.17
Over 20	56	37.0	.16	.43
CINCINNATI				
0	86	0	0.31	100.0+
1	63	1.0	1.5	100.0+
2-3	88	2.4	4.5	100.0+
4-10	70	6.4	1.8	28.2
Over 10	51	33.0	8.1	24.6
HENDERSON				
0-10	39	7.6	4.0	52.6
11-25	58	17.5	5.1	29.2
26-50	35	37.5	5.9	15.7
Over 50	48	208.3	15.8	7.6

A study of the results summarized in Tables Nos. 39 and 40, indicated that, although a considerable degree of variation existed in the corresponding group averages for the several plants, they were sufficiently in agreement with each other to permit their being combined into a single series of figures expressing, in each instance, the relationships existing between mean values of these several variables. In thus combining the group averages it was desired to give equal weight to the corresponding observations from the various plants; hence a simple arithmetical mean of the corresponding averages was taken in every case.

In Tables Nos. 41, 42, and 43 are tabulated the results obtained by combining in this manner the data for the individual plants as given in Table No. 35. In Table No. 44, the *B. coli* figures given in Table No. 43 in terms of the *B. coli* index have been converted to terms of Reed's most probable numbers [20] for comparison with the corresponding index figures given in Table No. 43. In the right-hand sections of the tables are shown the corresponding percentages of residual bacteria, referred, in each instance, to the count in the raw or particular influent water used as a basis of the grouping.

TABLE No. 41.—*Relation of bacterial counts at 20° C. in influents as delivered to successive stages of purification to corresponding counts in effluents from subsequent stages*

[Combination of data given in Tables Nos. 39 and 40]

A. REFERRED TO RAW-WATER COUNT

Raw-water count range	Number of tests	Average raw-water turbidity	Average bacterial count per cubic centimeter					Per cent of raw-water count			
			Raw	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated
Plants of both groups:[1]											
0-1000 [2]	162	35	410	244	147	17	3.1	59.5	35.8	4.1	0.76
1,001-2,500	236	94	1,690	420	244	17	2.7	24.8	14.4	1.0	.16
2,501-5,000	212	157	3,480	1,080	438	26	2.8	31.0	12.6	.75	.08
5,001-10,000	376	232	7,520	1,730	604	64	3.1	23.0	8.0	.85	.04
10,001-25,000	457	312	20,300	5,580	1,430	207	4.4	27.5	7.0	1.0	.02
Over 25,000	338	378	49,500	8,270	1,600	325	5.6	16.7	3.2	.66	.01

[1] Includes data for but 1 plant of Group II (Evansville).

[2] Abnormally high figures from the Steubenville and Louisville plants excluded from the averages for this group.

B. REFERRED TO PRIMARY SETTLED WATER COUNT

Primary settled water count range	Number of tests	Average raw-water turbidity	Average bacterial count per cubic centimeter					Per cent of settled water count			
			Raw	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated
Plants of Group I:											
0-250	138	--------	--------	193	122	12	3.3	--------	63.2	6.2	1.7
251-500	154	--------	--------	410	191	16	1.7	--------	46.6	3.9	.41
501-1,000	200	--------	--------	740	294	18	1.4	--------	39.7	2.4	.19
1,001-2,500	356	--------	--------	1,460	580	74	4.7	--------	39.7	5.1	.32
2,501-5,000	213	--------	--------	3,690	1,340	168	5.0	--------	36.3	4.5	.14
Over 5,000	273	--------	--------	10,500	1,670	535	8.0	--------	15.9	5.1	.08

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[20] The conversion was extremely simple as applied to the results obtained in the raw, primary settled, and applied waters, involving merely multiplying the index figure as given in Table No. 43 by the factor 2.31, disregarding anomalous results, which in this instance had been corrected or discarded. For the unchlorinated and chlorinated effluents, it was necessary to convert each individual index figure to terms of the most probable numbers of *B. coli*, in accordance with the equivalents as given on p. 74, and to retabulate and average the numbers thus obtained, having first placed them in their proper groups.

Table No. 41.—*Relation of bacterial counts at 20° C. in influents as delivered to successive stages of purification to corresponding counts in effluents from subsequent stages*—Continued

C. REFERRED TO COUNT IN WATER APPLIED TO FILTERS

Applied water count range	Number of tests	Average raw-water turbidity	Average bacterial count per cubic centimeter					Per cent of applied water count			
			Raw	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated
Plants of both groups:											
0-100	225	......	......	......	80	10	3.2	......	......	12.5	4.0
101-250	288	......	......	......	184	16	2.4	......	......	8.7	1.3
251-500	360	......	......	......	382	38	4.3	......	......	9.9	1.1
501-1,000	368	......	......	......	759	80	4.9	......	......	10.5	.65
1,001-2,000	402	......	......	......	1,450	214	4.3	......	......	14.8	.30
Over 2,000	180	......	......	......	3,280	508	9.0	......	......	15.5	.28

D. REFERRED TO UNCHLORINATED FILTERED WATER COUNT

Filtered water count range	Number of tests	Average raw-water turity bid-	Average bacterial count per cubic centimeter					Per cent of filtered water count			
			Raw	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated
Plants of both groups:											
0-5	94	......	......	......	......	2.8	1.5	......	......	......	53.6
6-10	246	......	......	......	......	8.3	2.3	......	......	......	27.7
11-25	239	......	......	......	......	19.0	3.7	......	......	......	19.5
26-100	527	......	......	......	......	73.0	5.1	......	......	......	7.0
101-300	300	......	......	......	......	235.0	11.1	......	......	......	4.7
Over 300	154	......	......	......	......	1,530.0	85.0	......	......	......	5.6

Table No. 42.—*Relation of bacterial counts at 37° C. in influents as delivered to successive stages of purification to corresponding counts in effluents from subsequent stages*

[Combination of data given in Tables Nos. 39 and 40]

A. REFERRED TO RAW-WATER COUNT

Raw-water count range	Number of tests	Average raw-water turbidity	Average bacterial count per cubic centimeter					Per cent of raw-water count			
			Raw	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated
All plants:											
0-500	765	125	254	63	60	4.0	0.78	24.8	23.6	1.6	0.31
501-1,000	433	170	810	181	144	7.2	1.2	22.4	17.8	.89	.15
1,001-2,000	473	253	1,500	328	250	10.3	2.0	21.9	16.7	.69	.13
2,001-5,000	434	269	3,410	453	429	15.6	3.6	13.3	12.6	.46	.11
Over 5,000	178	458	8,750	1,060	1,100	35.0	13.2	12.1	12.6	.40	.15
Plants of Group I:[1]											
0-500	292	120	258	63	29	1.8	0.5	24.4	11.2	.70	.19
501-1,000	175	188	758	181	98	4.2	.9	23.9	12.9	.55	.12
1,001-2,000	253	249	1,480	328	123	7.8	1.1	22.2	8.3	.53	.074
2,001-5,000	186	321	3,340	453	223	10.6	1.0	13.6	6.7	.32	.030
Over 5,000	92	372	8,040	1,060	251	22.5	4.0	13.2	3.1	.28	.050
Plants of Group II:[2]											
0-500	233	149	286	......	92	17.0	1.0	......	32.2	5.9	.35
501-1,000	217	183	793	......	181	25.0	1.5	......	22.8	3.2	.19
1,001-2,000	220	277	1,530	......	376	49.0	3.0	......	24.6	3.2	.20
2,001-5,000	203	324	3,390	......	626	58.0	5.9	......	18.4	1.7	.17
Over 5,000	86	443	9,460	......	1,950	278.0	22.4	......	20.6	2.9	.24

[1] Derived from data for Ironton, Portsmouth, and Cincinnati plants.
[2] Derived from data for East Liverpool, Huntington, and Ashland plants

Table No. 42.—*Relation of bacterial counts at 37° C. in influents as delivered to successive stages of purification to corresponding counts in effluents from subsequent stages*—Continued

B. REFERRED TO PRIMARY SETTLED-WATER COUNT

Primary settled-water count range	Number of tests	Average raw-water turbidity	Average bacterial count per cubic centimeter					Per cent of settled-water count			
			Raw	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated
Plants of Group I:											
0-100	505	------	------	52	22	2.5	0.62	------	42.3	4.8	1.2
101-250	374	------	------	174	68	5.6	.90	------	39.1	3.2	.52
251-500	170	------	------	376	168	10.2	.78	------	44.7	2.7	.21
501-1,000	166	------	------	677	264	12.8	3.8	------	39.0	1.9	.56
Over 1,000	101	------	------	1,900	371	40.0	7.1	------	19.5	2.1	.37

C. REFERRED TO COUNT IN WATER APPLIED TO FILTERS

Applied-water count range	Number of tests	Average raw-water turbidity	Average bacterial count per cubic centimeter					Per cent of applied-water count			
			Raw	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated
Plants of both groups:											
0-100	1,325	------	------	------	47	3.5	0.8	------	------	7.4	1.7
101-250	321	------	------	------	177	14.0	1.4	------	------	7.9	.79
251-500	392	------	------	------	360	38.0	3.7	------	------	10.6	1.0
501-1,000	132	------	------	------	735	95.0	5.8	------	------	12.9	.79
Over 1,000	101	------	------	------	2,060	290.0	26.1	------	------	14.1	1.3

D. REFERRED TO UNCHLORINATED FILTER-WATER COUNT

Filtered-water count range	Number of tests	Average raw-water turbidity	Average bacterial count per cubic centimeter					Per cent of filtered-water count			
			Raw	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated
Plants of both groups:											
0-1	236	------	------	------	------	0.46	0.32	------	------	------	70.0
2-5	494	------	------	------	------	2.6	.71	------	------	------	27.3
6-10	282	------	------	------	------	7.3	1.9	------	------	------	26.0
11-25	202	------	------	------	------	15.4	1.4	------	------	------	9.1
26-50	319	------	------	------	------	39.0	3.3	------	------	------	8.5
51-200	119	------	------	------	------	168.0	6.8	------	------	------	4.0
Over 200	79	------	------	------	------	623.0	38.0	------	------	------	6.1

Table No. 43.—*Relation of B. coli densities in influents as delivered to successive stages of purification to corresponding densities in effluents from subsequent stages*

[Combination of data given in Tables Nos. 39 and 40]

[B. coli densities expressed in terms of B. coli index per 100 c. c.]

A. REFERRED TO B. COLI IN RAW WATER

PLANTS OF BOTH GROUPS[1]

Number of tests	Average B. coli index per 100 c. c.					Per cent of raw water index			
	Raw	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated
231	10	6.4	5.5	1.7	[2] 0.25	64.0	55.0	17.0	2.5
402	100	64.0	53.0	2.8	.44	64.0	53.0	2.8	.44
1,067	1,000	361.0	259.0	4.1	.77	36.1	25.9	.41	.077
444	10,000	1,590.0	1,180.0	4.4	1.04	15.9	11.8	.044	.010

PLANTS OF GROUP I

Number of tests	Raw	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated
177	10	6.4	4.3	1.3	0.12	64.0	43.0	13.0	1.2
274	100	64.0	39.0	[2] 2.1	[4] .20	64.0	39.0	2.1	.20
669	1,000	361.0	126.0	[5] 3.8	[4] .31	36.1	12.6	.38	.031
275	10,000	1,590.0	301.0	4.2	.59	15.9	3.0	.042	.006

PLANTS OF GROUP II

Number of tests	Raw	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated
54	10	----------	[6] 7.9	[6] 2.6	[6] 1.2	--------	79.0	26.0	12.0
128	100	----------	72.0	3.5	.68	--------	72.0	3.5	.68
398	1,000	----------	480.0	4.4	.96	--------	48.0	.44	.096
169	10,000	----------	2,640.0	4.9	1.5	--------	26.4	.049	.015
26	100,000	----------	1,800.0	6.2	3.5	--------	1.8	.006	.004

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[1] Omitting Huntington plant, at which routine B. coli observations made only in raw water and final effluent.

[2] Abnormally high figure for East Liverpool plant excluded from mean.

[3] Abnormally high figure for Louisville plant excluded from mean.

[4] Average B. coli indices for Ironton and Portsmouth plants, recorded as zero, excluded from mean.

[5] Abnormally high figures for Steubenville and Louisville plants excluded from mean.

[6] Based on figure for East Liverpool plant only. Excluded from mean for all plants (see note 6).

B. REFERRED TO B. COLI IN PRIMARY SETTLED WATER

PLANTS OF GROUP I

Number of tests	Average B. coli index per 100 c. c.					Per cent of settled water index			
	Raw	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated
200	----------	10	6.4	1.7	0.07	--------	64.0	17.0	0.70
688	----------	100	50.0	3.2	.20	--------	50.0	3.2	.20
368	----------	1,000	156.0	5.6	.17	--------	15.6	.56	.017
51	----------	10,000	403.0	7.4	.32	--------	4.0	.074	.003

C. REFERRED TO B. COLI IN WATER APPLIED TO FILTERS

PLANTS OF BOTH GROUPS

Number of tests	Average B. coli index per 100 c. c.					Per cent of applied water index			
	Raw	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated
533	----------	----------	10	3.1	0.21	--------	--------	31.0	2.1
989	----------	----------	100	4.5	.36	--------	--------	4.5	.36
307	----------	----------	1,000	7.2	.83	--------	--------	.72	.083
63	----------	----------	10,000	[7] 4.9	[7] 1.5	--------	--------	.049	.002

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[1] Mean for [illegible] plants only (all in Group II).

Table No. 43.—*Relation of B. coli densities in influents as delivered to successive stages of purification to corresponding densities in effluents from subsequent stages*—Continued

D. REFERRED TO B. COLI IN FILTERED WATER (UNCHLORINATED)

PLANTS OF BOTH GROUPS [8]

Number of tests	Average B. coli index per 100 c. c.					Per cent of filtered water index			
	Raw	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated
358	---------	---------	---------	2	[9] 0.06	---------	---------	---------	3.0
225	---------	---------	---------	4	.14	---------	---------	---------	3.5
129	---------	---------	---------	6	.37	---------	---------	---------	6.1
120	---------	---------	---------	8	.64	---------	---------	---------	8.0
371	---------	---------	---------	10	.91	---------	---------	---------	9.1

[8] Exclusive of East Liverpool.
[9] Abnormally high figure for Steubenville plant excluded from mean.

Table No. 44.—*Relation of B. coli densities in raw water to corresponding densities in effluents from subsequent stages of purification*

[B. coli densities expressed in terms of Reed's "most probable numbers" per 100 c. c.]

PLANTS OF BOTH GROUPS

B. coli in raw water		Number of tests	Average "most probable" numbers of B. coli per 100 c. c.					Per cent of raw water numbers			
(+) in cubic centimeters	(−) in cubic centimeters		Raw	Settled	Applied	Filtered	Chlorinated	Settled	Applied	Filtered	Chlorinated
10	1	231	23.1	14.8	19	3.3	0.73	64.1	82.2	14.3	3.2
1	.1	402	231	149	122	5.7	.65	64.5	52.8	2.5	.28
.1	.01	1,030	2,310	984	653	9.9	1.2	42.6	28.3	.43	.052
.01	.001	370	23,100	4,160	3,080	11.2	1.8	18.0	13.3	.048	.008

PLANTS OF GROUP I

10	1	177	23.1	14.8	15	2.7	0.29	64.1	65.0	11.7	1.3
1	.1	274	231	149	90	5.7	.37	64.5	39.0	2.5	.16
.1	.01	632	2,310	984	310	10.3	.50	42.6	13.4	.45	.022
.01	.001	201	23,100	4,160	811	11.6	1.5	18.0	3.5	.050	.006

PLANTS OF GROUP II

10	1	54	23.1	--------	18	4.7	1.6	--------	77.9	20.4	6.9
1	.1	128	231	--------	166	5.7	1.4	--------	71.8	2.5	.61
.1	.01	398	2,310	--------	1,110	9.3	2.2	--------	48.1	.40	.095
.01	.001	169	23,100	--------	6,120	10.7	2.4	--------	26.5	.046	.01

In each one of the foregoing tables the correlations are indicated by the upward trend of the effluent figures coincident with increasing counts in the various influent waters. By plotting the raw or influent counts, as abscissæ, against the corresponding effluent counts, as ordinates, the relationships may be more clearly shown, as previously done in Figures 13 to 19, in connection with Part I of this report. In Figure 26 have been plotted the 37° C. count data given in Table No. 42, section A, as referred to the raw-water count, for the plants

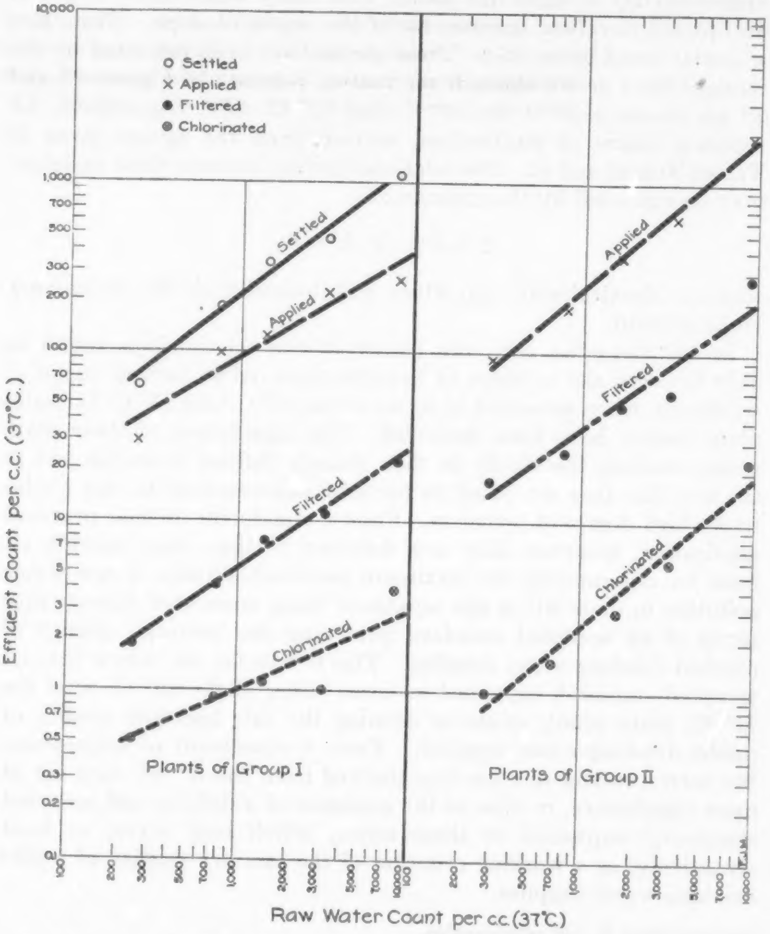

FIG. 26.—Relations between 24-hour bacterial counts at 37° C. in raw water and corresponding counts in effluents at various stages of treatment, as observed at plants of Groups I and II, respectively. (Plot of data given in Table No. 42)

of Groups I and II separately. In this and succeeding charts of the same type, logarithmic scales have been used for both abscissæ and ordinates, for reasons which previously have been pointed out.

On referring to Figure 26, it will be noted that, making due allowance for irregularities in the trend of the points inherent in observational data of this kind, they display a marked tendency to follow approximately straight-line paths, with fairly well-defined slopes in an upward direction, irrespective of the degree of slope. (Note also a similar trend in fig. 27.) These trends have been indicated by the straight lines drawn through the plotted points. In Figures 28 and 29 are shown plots of the 20° C. and 37° C. data, respectively, for separate stages of purification, derived from the figures given in Tables Nos. 41 and 42. The relations existing between these variables may be expressed by the equation:

$$E=cR^n, \text{ or } E=cI^n,$$

which is identical with that which was derived from the preliminary study of 1916.

In the foregoing text, the nature of the relationships found to exist between the numbers of bacteria observed at various stages of treatment, when measured in terms of the 20° C. and 37° C. bacterial plate counts, have been described. The significance of these plate count relations lies chiefly in their sharply defined character and in the fact that they are based on bacterial enumerations having a relatively high degree of precision. From a standpoint of their practical application, however, they are deficient in that they provide no basis for determining the maximum permissible limits of raw water pollution in units which are capable of being translated directly into terms of an accepted standard governing the bacterial quality of purified drinking-water supplies. This is true for the reason that no accepted standard, expressed in terms either of the 20° C. or of the 37° C. plate count, exists as defining the safe bacterial quality of public drinking-water supplies. From a standpoint of application, the corresponding relationships derived from the *B. coli* data are of more significance, in view of the existence of a definite and accepted standard,[21] expressed in these terms, which may serve, at least tentatively, as a working criterion of the sanitary quality of public drinking-water supplies.

Corresponding B. coli relationships.

The relations observed between the *B. coli* content of the raw water and of the effluent waters at the various stages of purification have been shown by the data given in Tables Nos. 43 and 44. In Table No. 44 the results given in Table No. 43 in terms of the *B. coli* index have been converted to terms of Reed's most probable numbers[22]

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[21] Reference here is made to the U. S. Treasury Department standard, described on p. 75.

[22] See p. 68 of this report.

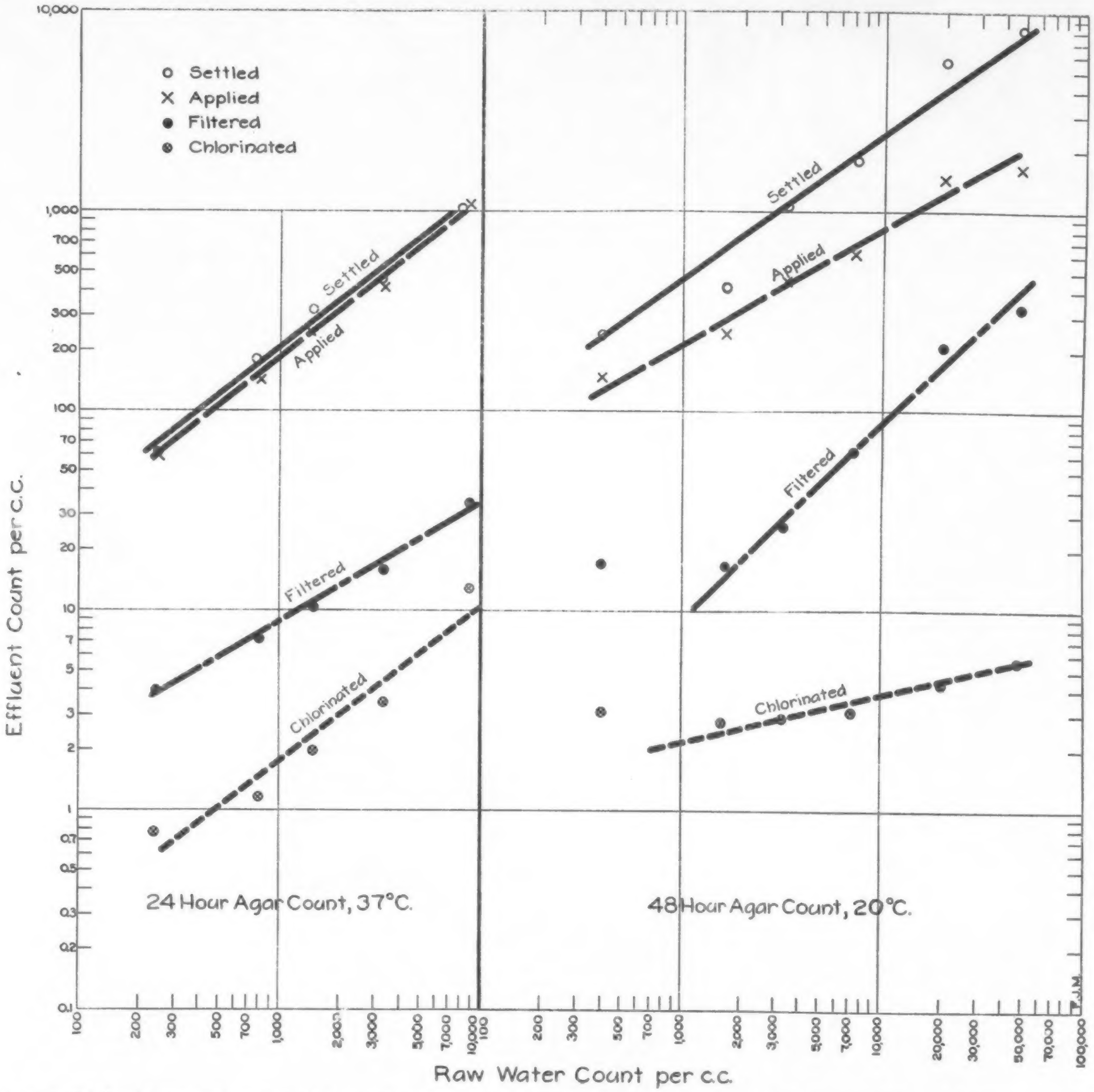

Fig. 27.—Relations between numbers of bacteria in raw water and corresponding numbers in effluents from various stages of treatment, as derived from combined data from the 10 Ohio River plants. (Plot of data given in Tables Nos. 41 and 42)

44596—27. (Face p. 124.) No. 1

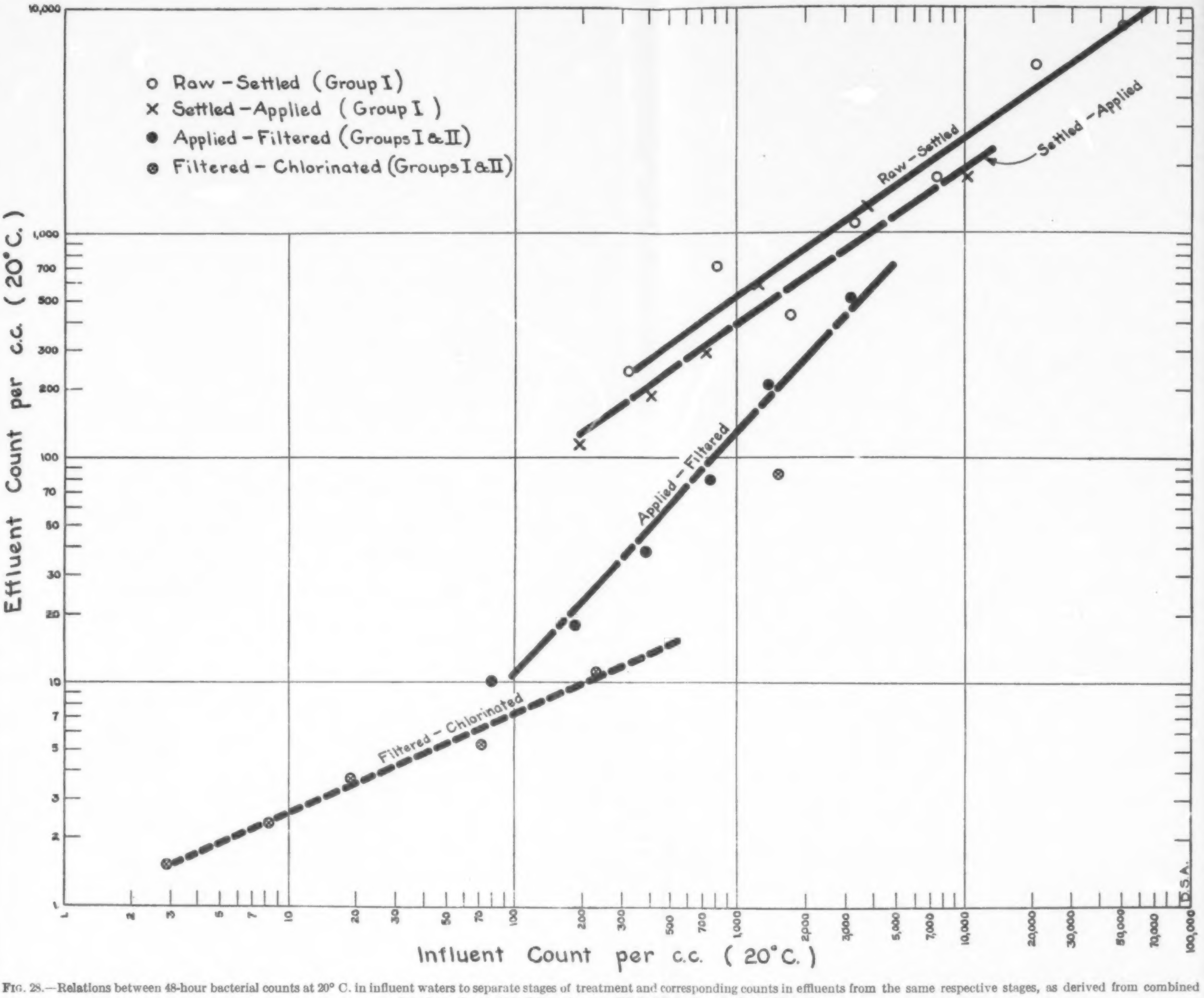

FIG. 28.—Relations between 48-hour bacterial counts at 20° C. in influent waters to separate stages of treatment and corresponding counts in effluents from the same respective stages, as derived from combined data from the 10 Ohio River plants. (Plot of data given in Table No. 41)

44596—27. (Face p. 124.) No. 2

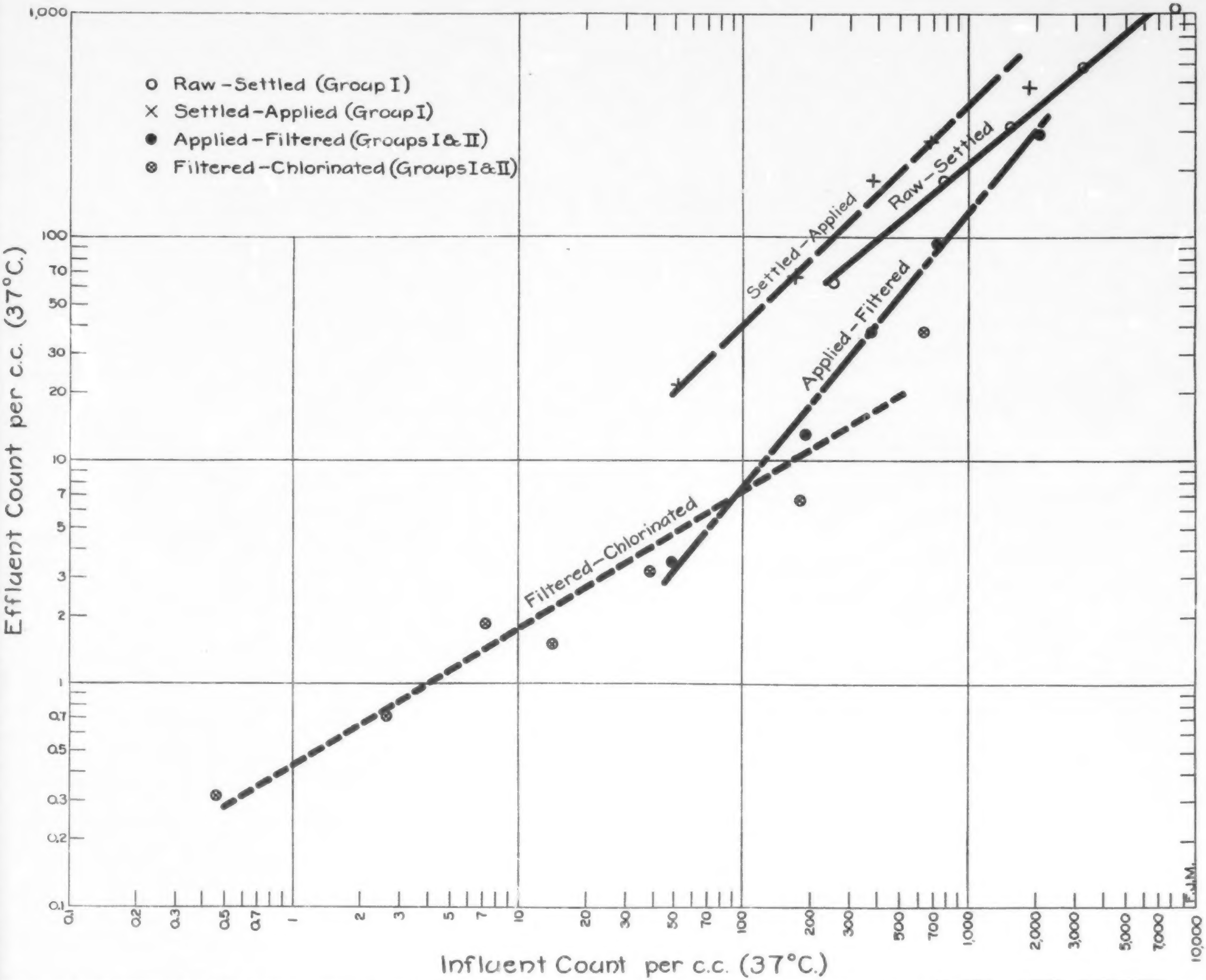

FIG. 29.—Relations between 24-hour bacterial counts at 37° C. in influent waters to separate stages of treatment and corresponding counts in effluents from the same respective stages, as derived from combined data from the 10 Ohio River plants. (Plot of data given in Table No. 42)

44596—27. (Face p. 124.) No. 3

124- C.

It is difficult to assign a satisfactory reason for the discrepancy noted, which might be due either to a true tendency of the Ohio River plants to produce filter effluents of greater constancy as regards their *B. coli* content under the conditions observed in 1924 than under those prevailing in 1916, or to an apparent tendency of this kind resulting from the different method used in determining the *B. coli* index of these effluents in 1924, as compared with the procedure followed in 1915.[23] Either one or both of these two possible factors would account for the inconsistency in question, the latter for the reason that routine *B. coli* tests of the effluents made in portions of samples including those less than 10 cubic centimeters in volume would give higher percentages of positive results in volumes smaller than 10 cubic centimeters when the density of *B. coli* in the samples were in the higher ranges of magnitude corresponding to the upper portions of the plots in Figure 30, than when they were in the lower ranges. Correlation plots derived from series of tests made in this manner would have a tendency, therefore, to be steeper in slope than those shown in Figure 30; that is, to approach more nearly the slopes of the plots derived from the tests of samples at stages prior to filtration, which were made in volumes following a geometric series. In connection with the experimental studies of water purification in progress at Cincinnati at this writing,[24] an extensive series of parallel tests, following both methods of procedure in all *B. coli* tests of the unchlorinated and chlorinated effluents, is being made for the purpose of determining the extent to which the latter of the two factors noted might be responsible for the disparity in the relationship plots above described. Pending completion and later publication of the results [25] of these comparative tests, it is pertinent to note that the results of them obtained to date tend decidedly to indicate that this factor is responsible to a large extent for the disparity in question and that the relationship plots of the *B. coli* data obtained from the 1924 observations of both unchlorinated and chlorinated filter effluents, as shown in Figure 30, must be interpreted with due regard for the possible source of error described. This source of error, however, would not affect materially the results obtained in the lower ranges of *B. coli* density bordering on that of the Treasury Department standard; hence the lower sections of the plots may be regarded as being sufficiently reliable for the purpose at hand.

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[23] That is, the determination of the *B. coli* index from routine tests of five 10 c. c. portions of each sample, rather than from tests of single portions comprising 0.1 c. c., 1 c. c., and 10 c. c., such as were made in connection with the 1916 study.

[24] See p. XIX for further reference to the purpose of these studies and their relation to the surveys with which this report deals.

[25] For a preliminary review of these results, see Public Health Reports, Oct. 1, 1925, pp. 2121–2146.

To complete the foregoing series of charts, Figures 32 and 33 have been drawn, showing the numbers of bacteria observed in the unchlorinated and chlorinated effluents, respectively, in relation to corresponding numbers in the raw water, as determined from the combined data for the Ohio River plants, considered as a single group. In these two charts, which have been plotted from the figures given in Tables Nos. 41, 42, and 43, the contrast between the comparatively flat slopes of the *B. coli* graphs and steeper slopes of those derived from the plate count data is evident.

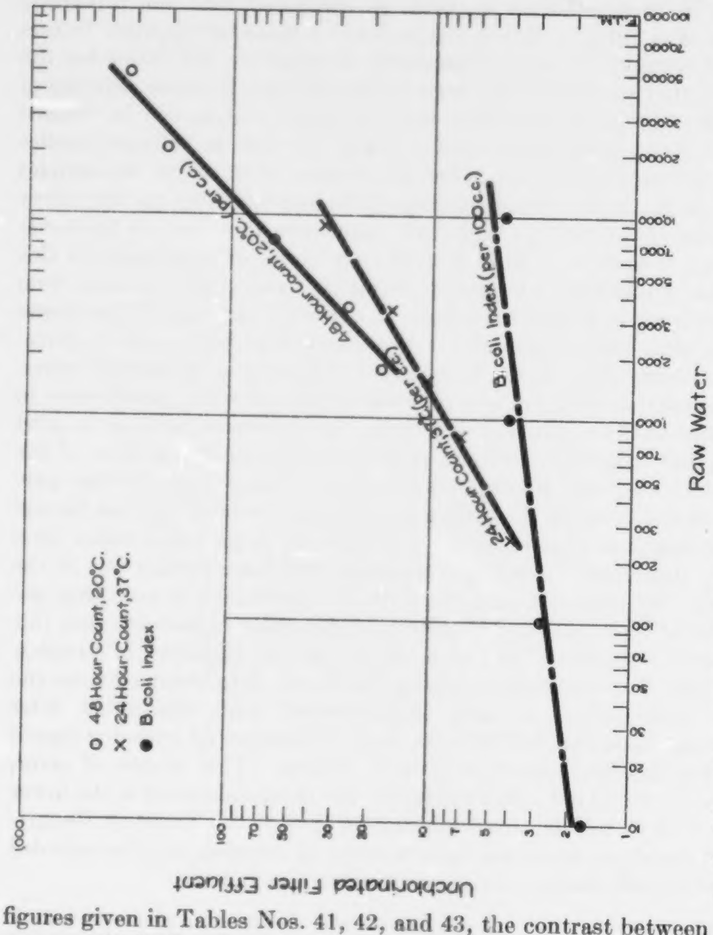

FIG. 32.—Relations between numbers of bacteria and *B. coli* in raw water and corresponding numbers in unchlorinated filter effluent, as derived from combined data from the 10 Ohio River plants. (Plot of data given in Tables Nos. 41, 42, and 43)

Variation of Individual Counts from Group Averages.

In considering the group averages which have been presented in the foregoing tables and charts it is pertinent to note briefly the approximate deviations which individual bacterial counts falling within the various groups have shown with respect to the various group means derived from them. In Table No. 45 are given two examples of the average variations thus observed, the figures in this table having been computed from groupings of the 24-hour, 37° C. counts observed at the Ashland and Huntington plants with raw-water turbidities ranging from zero to 100 and from 101 to 500, respectively, in both instances. On referring to the mean percentages of deviation given at the foot of each section of the table, it is noted that a consistently marked tendency is shown toward higher variations from the group mean as the water passes from the raw state to that of the final effluent. This tendency would be expected, however, in view of the fact that in the case cited the groupings were arranged according to raw-water counts falling within specified ranges, and the correlation

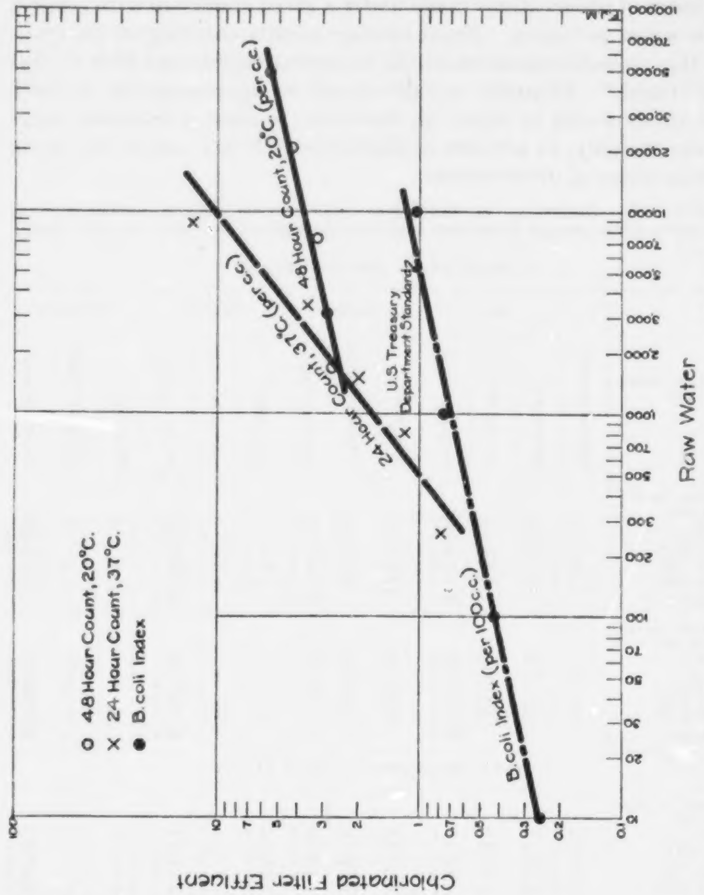

FIG. 33.—Relations between numbers of bacteria and *B. coli* in raw water and corresponding numbers in chlorinated filter effluent, as derived from combined data from the 10 Ohio River plants. (Plot of data given in Tables Nos. 41, 42, and 43)

of the effluent counts with these raw-water figures would be expected, as previously noted, to become more poorly defined at each successive stage of treatment. The average percentages for the final effluent would indicate that deviations averaging somewhere between 70 per cent and slightly over 100 per cent would be expected in the bacterial content of individual samples as compared with the mean content for a series of observations made under a given condition with respect to raw-water pollution. From average counts covering 25 observations the probable variation would be approximately one-fifth of that above stated.[26] Monthly averages based on approximately 25 daily observations would be expected, therefore, to show a variation ranging from, roughly, 15 per cent to slightly over 20 per cent of the mean of a long series of observations.

TABLE No. 45.—*Deviations of individual plate counts falling within various raw-water count groups from their corresponding group averages (24-hour count, 37° C.)*

A. DATA FROM ASHLAND PLANT

Raw-water count range	Number of items	Raw			Applied			Filtered			Chlorinated		
		Mean count	Average deviation	Per cent of mean	Mean count	Average deviation	Per cent of mean	Mean count	Average deviation	Per cent of mean	Mean count	Average deviation	Per cent of mean
Raw-water turbidity=0-100:													
0-250	12	155	50	32.3	53	36	67.8	5.3	5.3	100.0	0.50	0.67	134.0
251-500	24	377	64	16.9	84	60	71.4	9.9	13.0	132.0	1.1	1.2	109.0
501-1,000	42	783	141	18.0	151	87	57.5	14.0	12.0	85.7	1.2	1.2	100.0
1,001-2,000	24	1,410	281	19.9	222	147	66.3	26.0	32.0	123.0	.74	1.04	141.0
Over 2,000	4	2,650	360	13.6	347	136	39.2	17.0	8.8	51.7	.75	.75	100.0
Mean				20.1			60.4			98.5			116.8
Raw-water turbidity=101-500:													
0-250	9	183	31	16.9	69	50	72.4	6.0	4.0	66.7	1.1	1.0	91.0
251-500	34	371	51	13.7	75	35	46.7	5.1	3.5	68.6	1.6	2.0	125.0
501-1,000	47	744	126	16.9	88	53	60.3	7.0	7.0	100.0	1.0	.89	89.0
1,001-2,000	41	1,420	266	18.7	116	68	58.6	13.0	16.0	123.0	1.2	1.1	91.5
Over 2,000	14	3,790	1,800	47.5	146	112	76.7	16.0	15.0	93.7	.57	.57	100.0
Mean				22.7			62.9			90.4			99.3
B. DATA FROM HUNTINGTON PLANT													
Raw-water turbidity=0-100:													
0-500	68	262	130	49.6	94	57	60.7	3.9	2.7	69.2	0.81	0.71	87.6
501-1,000	39	814	128	15.7	308	115	37.4	13.0	6.8	52.3	1.7	1.3	76.5
1,001-2,000	23	1,580	227	14.4	611	220	36.0	22.0	1.4	63.6	2.1	1.3	61.8
2,001-5,000	16	3,530	719	20.4	1,130	364	32.2	37.0	15.0	40.5	2.4	1.3	54.2
Over 5,000	2	8,500	1,500	17.7	3,250	750	23.0	65.0	15.0	23.1	2.0	1.0	50.0
Mean				25.0			41.6			56.4			70.0
Raw-water turbidity=101-500:													
0-500	19	250	135	54.0	72	46	63.9	4.1	3.8	92.7	.74	.78	106.0
501-1,000	35	870	115	13.2	217	94	43.3	8.5	6.3	74.2	1.4	1.2	85.7
1,001-2,000	39	1,560	273	17.5	492	189	38.4	14.0	5.9	42.2	2.2	1.4	63.7
2,001-5,000	40	3,460	984	28.4	1,040	557	53.5	26.0	16.0	61.5	1.7	1.1	64.7
Over 5,000	2	6,500	500	7.7	2,250	750	33.3	55.0	5.0	9.1	3.5	.5	14.3
Mean				28.3			49.8			67.7			80.0

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[26] Applying the statistical rule which states that the probable error, or variation, of a given mean is inversely proportional to the square root of the number of observations on which the mean is based.

Formulation of Relationships.

It previously has been shown that the straight-line trend of the foregoing logarithmic plots of the data is such as to indicate that the relations observed between the bacterial content of the raw water and that of the effluents from various stages of treatment may be expressed by the general power-function equation:

$$E=cR^n.$$

In Table No. 46 are tabulated values of *c* and *n* derived from the plots of the 20° C. count, 37° C. count and *B. coli* data given in Tables Nos. 41, 42, and 43. In the first section of the table are shown values derived from graphs of the relationship when referred to the bacterial content of the raw water, as given in section A of the three tables just noted. These values are based on plots of the data for the plants of both groups, I and II, combined. In the second section of the table are given the values of *c* and *n* derived from plots, as in Figures 28 and 29, showing the relations between the bacterial qualities of the influent and effluent waters at separate stages of purification. A considerable variation is indicated in the values of both constants, and especially in those of *c*. In but two instances is the value of *n* indicated as being greater than unity, both of them being in section B of the table and referring to the 20° C. and 37° C. counts, respectively, of the unchlorinated filter effluent. In a number of instances a tendency is noticeable for the value of *c* to be low where the corresponding value of *n* is relatively high, and vice versa. In section A of the table it will further be noted that where the plots are referred to the raw water, the value of *c* tends to become diminished after each successive stage of treatment. A comparison of the graphs which have been presented shows that these trends in the values are due to the manner in which the plots are related to each other.

TABLE No. 46.—*Values of c and n in equation, $E=cR^n$, as determined from plots of data given in Tables Nos. 41, 42, and 43*

A. REFERRED TO BACTERIAL CONTENT OF RAW WATER

Effluent	48-hour count, 20° C.		24-hour count, 37° C.		B. coli index	
	c	*n*	*c*	*n*	*c*	*n*
Primary settled [1]	2.9	0.72	0.86	0.79	2.4	0.71
Applied to filters	4.0	.58	.74	.79	2.4	.67
Filtered-unchlorinated [2]	.01	.97	.14	.61	[3].1	[3].45
Filtered-chlorinated [2]	.44	.24	.008	.78	6.15	.22

B. REFERRED TO BACTERIAL CONTENT OF INFLUENT WATER OF EACH RESPECTIVE STAGE

Effluent	48-hour count, 20° C.		24-hour count, 37° C.		B. coli index	
	c	*n*	*c*	*n*	*c*	*n*
Primary settled [1]	2.5	0.75	1.00	0.79	2.4	0.71
Applied to filters [2]	2.8	.73	.44	.96	8.0	.43
Filtered-unchlorinated [2]	.15	1.00	.023	1.25	2.1	.17
Filtered-chlorinated [2]	1.0	.41	.40	.66	.008	2.10

[1] Based on data for plants of Group I.

[2] Based on data for plants of Groups I and II combined.

[3] Based on data for three plants. (See fig. 34.) Values derived from data for the 10 plants, which may be considered as less reliable, are as follows: $c=1.3$; $n=0.17$.

Comparison of the values of *c* and *n* given in Table No. 46 with corresponding values derived from the preliminary study of the Cincinnati and Louisville plants in 1915–16 brings out some interesting parallelisms and divergences. In Table No. 47, in which the comparison is shown, the figures in the columns designated as *b* have been transcribed from Table No. 46, and those in columns *a* from the 1916 data given in Table No. 19. Considering the differences existing in the methods by which the two series of values were obtained, they would be expected to display a considerable amount of divergence from each other in individual cases. In view of this circumstance, the close agreement shown between the two series of *c* and *n* values as derived from the 48-hour counts at 20° C. is particularly striking. The values both of *c* and of *n*, derived from the 24-hour counts at 37° C. are less in accord with each other, though they agree fairly well in several instances. As regards the values of *n*, which have a greater influence in determining the trend of the relationship curve than do the values of *c*, the widest and most significant disparity between the two series is found in the *B. coli* figures for the unchlorinated filter effluent, from which an *n* value of 0.69 was obtained in the 1916 study and one of 0.17 in that of 1924. Reference is made, in this connection, to a previous discussion (pp. 81–83) of the inconsistency existing between the slopes of the plots derived from the 1916 and the 1924 observations, respectively, as regards the relations between the *B. coli* index of the raw water and that of the unchlorinated and chlorinated filter effluents. It is noteworthy, however, that the values of both *c* and *n* derived from plots of the *B. coli* data for the chlorinated filter effluents agree with each other much more closely in the two series of observations than do those obtained from similar plots for the unchlorinated filter effluents, thus indicating that the inconsistency above mentioned did not affect the former to anywhere near the extent that it did the latter.

TABLE No. 47.—*Comparison of values of c and n in equation, $E=cR^n$, as determined: (a) From observations at Cincinnati and Louisville plants in 1915–16, and (b) from combined observations at 10 Ohio River plants in 1923–24*

A. VALUE OF *c*

Effluent	48-hour count, 20° C.		24-hour count, 37° C.		B. coli index	
	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)
Primary settled	3.0	2.9	2.0	0.86	4.6	2.4
Applied to filters	2.0	4.0	1.6	.74	19.0	2.4
Filtered, unchlorinated	.016	.01	.28	.14	.12	[1] .16
Filtered, chlorinated	4.4	.44	.27	.008	.29	.15

B. VALUE OF *n*

Primary settled	0.75	0.72	0.78	0.79	0.68	0.71
Applied to filters	.64	.58	.66	.79	.35	.67
Filtered, unchlorinated	.94	97	.83	.61	.69	[1] .45
Filtered, chlorinated	.27	24	.54	.78	.30	.22

[1] See note 3, Table No. 46.

On referring to Table No. 46, it will be noted that the values of *c* and *n* given in the table for all of the relationships except those involving the primary settled water, have been derived from the combined data for the 10 Ohio River plants, considered as a single group. For purposes of later reference it is pertinent to give the values of the two constants defining the relations between the bacterial quality of the raw water and that of the chlorinated filter effluent, for the plants of Groups I and II, considered separately. These values, derived from plots similar to those shown in Figures 32 and 33, are as follows:

	Group I		Group II	
	(c)	(n)	(c)	(n)
Raw: Chlorinated filter effluent:				
24-hour count, 37° C	0.038	0.46	0.0055	0.89
B. coli index	.064	.25	.22	.23

Corresponding values based on the 20° C. plate count relationships have not been included in the above tabulation, for the reason that data expressed in these terms were available from but one plant of Group II and no satisfactory basis exists, therefore, for a comparison of the performance of the two groups of plants on this basis.

Discussion of Foregoing Relationships.

In a broad sense, the most significant feature of the foregoing relationships has been the indication of a consistently marked deterioration in the bacterial quality of the effluents produced by all of the Ohio River plants, observed coincidently with increases occurring in the density of bacterial pollution of their raw water supplies. As far as the bacteria enumerated in the 20° C. and 37° C. plate counts are concerned, these relationships afford a satisfactory means of determining, with a sufficiently high degree of precision for all practical purposes, the average character of effluents, in quantitative terms of bacterial content, which may be expected to be produced by these plants under varying conditions of raw water pollution, when measured in similar terms. As regards the bacteria of the *B. coli* group, however, their relationships as derived from the observations described in this section of the report must be regarded as providing a considerably less satisfactory basis for making such a determination, for reasons which previously have been pointed out. (See p. 127.) In the discussion which follows, it will be desirable to bear these points in mind, in order that due allowance may be made for such tentative conclusions as may be drawn from the observations in question.

QUALITY OF EFFLUENTS PRODUCED WITH VARYING DEGREES OF RAW WATER POLLUTION

On referring to the graphs shown in Figures 26 to 34, inclusive, it will be noted that each one of them defines a smoothed relationship as existing between the bacterial quality of the raw or of a particular influent water and that of the various effluents at subsequent stages of treatment. In Table No. 48 the numbers of bacteria in the successive effluents corresponding to given numbers in the raw water have been taken from the graphs and tabulated as shown. In the right-hand portion of the table are given the percentages of the raw water count which are represented by the various effluent counts. Both the bacterial figures and the percentages are given in round numbers, the relative precision of the data being such as hardly to justify any particular refinement in this respect. The figures in the table, excepting those for the "settled" water, have been derived from the combined data for the 10 Ohio River plants.

TABLE No. 48.—*Numbers and residual percentages of bacteria in effluents, corresponding to given numbers in raw water, as estimated from plots of the combined data for the 10 Ohio River plants, shown in Figures 27 and 30*

48-HOUR AGAR COUNT, 20° C. (PER C. C.)

	Bacterial count				Per cent of raw water remaining in—			
Raw	Settled[1]	Applied	Filtered	Chlorinated	Settled[1]	Applied	Filtered	Chlorinated
100	76	56	1.0	1.3	76.0	56.0	1.00	1.30
500	270	140	4.4	1.8	54.0	28.0	.88	.36
1,000	450	210	8.5	2.2	45.0	21.0	.85	.22
5,000	1,460	540	40.0	3.2	29.2	10.8	.80	.06
10,000	2,400	800	78.0	3.8	24.0	8.5	.78	.04
24-HOUR AGAR COUNT, 37° C. (PER C. C.)								
100	33	29	2.2	0.2	33.0	29.0	2.20	0.20
500	130	105	5.8	.9	26.0	21.0	1.16	.18
1,000	210	180	8.8	1.7	21.0	18.0	.88	.17
5,000	740	660	23.0	6.2	14.8	13.2	.46	.12
10,000	1,250	1,140	36.0	10.5	12.5	11.4	.36	.10
B. COLI INDEX (PER 100 C. C.)								
100	65	54	2.7	0.4	65.0	54.0	2.70	0.40
500	210	170	3.5	.6	42.0	34.0	.70	.12
1,000	350	260	4.0	.7	35.0	26.0	.40	.07
5,000	1,100	780	5.3	1.0	22.0	15.6	.11	.02
10,000	1,750	1,250	5.9	1.2	17.5	12.5	.06	.01

[1] Based on data for plants of Group I only.

In Table No. 49 a comparison has been made of the bacterial counts shown in the effluents common to plants of Groups I and II, respectively, corresponding to given numbers in the raw water. Figures based on the 20° C. count have not been included in the tabulation, for reasons previously stated.

Table No. 49.—*Comparative numbers and residual percentages of bacteria in effluents from plates of Groups I and II, respectively, corresponding to given numbers in the raw water, as estimated from plots of data shown in Figure 26*

24-HOUR COUNT, 37° C. (PER C. C.)

Raw	Bacterial count						Per cent of raw water count remaining in—					
	Applied		Filtered		Chlorinated		Applied		Filtered		Chlorinated	
	I	II	I	II	I	II	I	II	I	II	I	II
100	22	31	1.0	6.8	0.3	0.3	22.0	31	1.0	6.8	0.30	0.30
500	60	140	3.2	22.0	.7	1.3	12.0	28	.64	4.4	.14	.26
1,000	90	250	5.3	37.0	1.0	2.5	9.0	25	.53	3.7	.10	.25
5,000	250	1,050	17.0	125.0	2.2	10.0	5.0	21	.34	2.5	.04	.20
10,000	380	1,900	25.0	200.0	3.0	19.0	3.8	19	.25	2.0	.03	.19
B. COLI INDEX (PER 100 C. C.)												
100	40	75	2.1	3.5	0.2	0.6	40.0	75	2.1	3.5	0.20	0.60
500	84	270	3.1	4.0	.3	.9	16.8	54	.62	.80	.06	.18
1,000	120	490	3.8	4.3	.4	1.0	12.0	49	.38	.43	.04	.10
5,000	240	1,600	5.6	4.8	.5	1.5	4.8	32	.11	.09	.01	.03
10,000	340	2,900	6.6	5.2	.6	1.8	3.4	29	.07	.05	.006	.02

A mere inspection of Table No. 49 shows clearly the advantage possessed by the plants of Group I over those of Group II as regards their efficiency of bacterial removal under parallel conditions of bacterial loading. It is noteworthy in this connection that the margin of difference shown between the two groups of plants in this respect is, on the whole, greater the higher the numbers of bacteria present in the raw water. That the greater bacterial efficiency of the plants of Group I is due primarily to the use of an additional stage of preliminary sedimentation is indicated by the fact that the quality of the "applied" water as delivered to the filters is shown to be decidedly better for these plants than for those of Group II. The difference between the average percentages of raw water bacteria remaining in the "applied" water of the plants of Groups I and II, respectively, is 13.4 per cent, based on the 37° C. count and 32.4 per cent, based on the *B. coli* index. These two figures indicate roughly the added percentages of bacterial removal accomplished by double-stage, as compared with single-stage, preliminary sedimentation.

A comparison of the bacterial quality of effluents delivered by the 10 Ohio River plants, as compared with that of corresponding effluents produced by the Cincinnati and Louisville plants in 1915–16, is given in Table No. 50.[27] The comparison indicates clearly that the average quality of effluents produced by the Ohio River plants in 1924 was decidedly better, under similar conditions of raw water pollution, than was that of effluents obtained from two of these plants in 1916. In so far as the performance of the Cincinnati and Louisville plants as observed in 1916 was fairly representative of the efficiency of the average Ohio River plant at that time, the comparison of the two series of results indicates a marked improvement as having taken place in the bacterial efficiency of Ohio River plants during the period of eight years intervening between the two sets of observations.

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[27] The 1915–16 figures have been taken from the relationships shown in Pt. I, Table No. 11 and Fig. 16.

TABLE No. 50.—*Comparative numbers and residual percentages of bacteria in effluents from (a) 10 Ohio River plants in 1923–24 and (b) Cincinnati and Louisville plants in 1915–16, respectively, corresponding to given numbers in raw water*

24-HOUR COUNT, 37° C. (PER C. C.)

Raw	Bacterial count						Per cent of raw water count remaining in—					
	Applied		Filtered		Chlorinated		Applied		Filtered		Chlorinated	
	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
100	29	30	2.2	13	0.2	3.3	29.0	30.0	2.20	13.0	0.20	3.3
500	105	84	5.8	50	.9	7.7	21.0	16.8	1.16	10.0	.18	1.5
1,000	180	140	8.8	90	1.7	11.0	18.0	14.0	.88	9.0	.17	1.1
5,000	660	380	23.0	340	6.2	27.0	13.2	7.6	.46	6.8	.12	.54
10,000	1,140	600	36.0	600	10.5	40.0	11.4	6.0	.36	6.0	.10	.40

B. COLI INDEX (PER 100 C. C.)

Raw	Applied (a)	Applied (b)	Filtered (a)	Filtered (b)	Chlorinated (a)	Chlorinated (b)	Applied (a)	Applied (b)	Filtered (a)	Filtered (b)	Chlorinated (a)	Chlorinated (b)
100	54	100	1.3	3	0.4	1.1	54.0	100.0	1.3	3.0	0.40	1.1
500	170	160	2.6	9	.6	1.8	34.0	32.0	.52	1.8	.12	.36
1,000	260	210	3.6	15	.7	2.3	26.0	21.0	.36	1.5	.07	.23
5,000	780	360	7.3	44	1.0	3.7	15.6	7.2	.14	.88	.02	.07
10,000	1,250	460	10.0	70	1.2	4.5	12.5	4.6	.10	.70	.01	.04

LIMITING NUMBERS OF B. COLI IN RAW WATER CONSISTENT WITH THE PRODUCTION OF CHLORINATED EFFLUENTS CONFORMING TO THE UNITED STATES TREASURY DEPARTMENT STANDARD

The Treasury Department standard, which previously has been described,[28] requires, in effect, that not more than 10 per cent of a series of 10 cubic centimeter portions of water from a given source (a standard sample comprises five portions) shall show a positive test for *B. coli*. Figured in terms of the *B. coli* index, this specification limits the index to 1.0 per 100 cubic centimeters, or, when expressed in terms of Reed's most probable numbers, 1.05 per 100 cubic centimeters.

On referring to Figure 33, it will be noted that the line representing the relation between the *B. coli* index of the raw water and that of the chlorinated filter effluent intersects the horizontal line corresponding to a *B. coli* index of 1.0 per 100 cubic centimeters in the effluent at an abscissal value of approximately 5,000 per 100 cubic centimeters, which value defines the maximum limiting *B. coli* index of the raw water consistent with producing a chlorinated effluent conforming to the standard in question. An alternative method of checking this determination is to compute the limiting value of (R) in the formula, $E=cR^n$, using as c and n the values, 0.15 and 0.22, respectively, as given in Table No. 47, assigning 1.0 as the value of E and solving for R.[29] By this method a computed value of R equivalent to 5,060 *B. coli* per 100 cubic centimeters is obtained. The round figure, 5,000 per 100 cubic centimeters, is sufficiently precise for all practical purposes and may be taken as the working observational maximum in the case at hand.[30]

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[28] See pages 83–84.

The maximum thus indicated is of a considerably higher order of magnitude than the corresponding one derived from the preliminary study of 1916, which, as previously noted,[31] was represented by a raw water *B. coli* index of 650 per 100 cubic centimeters. In this connection it should be recalled, moreover, that at the time of the 1916 observations the limit of *B. coli* allowed by the Treasury Department standard was 2.0 per 100 cubic centimeters; hence the maximum raw water index of 650, as then determined, was based on a less rigid requirement as to effluent quality than the higher maximum established, as above described, from the series of observations made in 1924. The divergence between the two maxima affords further evidence of the marked improvement in the bacterial efficiency of Ohio River filtration plants during the interim of eight years. Although no systematic observations were made of the performance of Ohio River plants other than those at Cincinnati and Louisville in connection with the study of 1916, such past records as are available indicate that the comparative figures in Table No. 50 reflect a tendency toward an improvement in bacterial removal which has been fairly general among Ohio River plants during the past few years. It will be noted, however, that the advantage in respect to bacterial efficiency shown by these plants in 1924 appears to be confined mainly to the last two stages of treatment, namely, filtration and chlorination; hence the improvement indicated has been gained largely through increased efficiency of these two stages of treatment.

Relation to Variations in Seasonal Conditions.

The *B. coli* maximum above described represents an average for the 10 Ohio River plants under all conditions of season and raw-water turbidity, the latter of which previously has been shown to exert relatively little modifying influence upon the efficiency of *B. coli* removal. The question as to what effects, if any, may be exerted by variations in season on the permissible raw-water limit of *B. coli* content, by reason of their possible relation to the efficiency of *B. coli* removal, is important for the reason that in the Ohio River, as in other similar streams, conditions in respect to temperature and other seasonal factors may remain fairly constant for sufficiently long periods of time for such effects to become manifest.

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[29] The transposed expression is: $R=\left(E/c\right)^{1/n}$

[30] The rationality of this figure has been confirmed by the results obtained thus far from the experimental studies in progress at this writing which have indicated that the maximum *B. coli* index of the raw water, as delivered to the experimental plant, consistent with producing a chlorinated filter effluent conforming to the present Treasury Department standard, is approximately 6,000 per 100 cubic centimeters.

[31] See Part I, this report.

As regards the influence of seasonal variations, the preliminary study made in 1916 indicated that although the bacterial efficiency of certain stages of treatment was affected by this factor to some extent, a tendency existed toward a mutual compensation, by the various stages, of variations in efficiency caused by changes in season, so that the over-all efficiency tended to remain fairly constant, irrespective of such changes. In the present instance, the data at hand have confirmed this general observation, particularly in respect to the removal of *B. coli*, as is exemplified by the comparative figures given in Table No. 51, showing the relations between the numbers of *B. coli* observed in the effluents from four Ohio River plants during two seasonal periods of six months each, November to April and May to October, corresponding to *B. coli* indices of 100, 1,000, and 10,000 per 100 cubic centimeters, respectively, as observed in the raw water. The figures in the table have been derived as follows: (a) by separating the *B. coli* data for each one of the four plants into the two seasonal classes; (b) by grouping the data in each class according to the raw-water index; and (c) by averaging the corresponding group means thus derived.

TABLE No. 51.—*Comparative average B. coli indices observed in effluents from four Ohio River plants*[1] *corresponding to given indices in raw water, during two periods: (a) November to April, inclusive, and (b) May to October, inclusive*

Raw	B. coli index per 100 c. c.						Per cent of raw-water index remaining in—					
	Applied		Filtered		Chlorinated		Applied		Filtered		Chlorinated	
	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
100	35	56	2.9	2.7	0.59	0.72	35.0	56.0	2.90	2.70	0.59	0.72
1,000	88	99	3.1	4.7	.60	.64	8.8	9.9	.31	.47	.060	.064
10,000	103	114	4.1	4.4	1.11	.91	1.0	1.1	.041	.044	.011	.009

[1] East Liverpool, Ironton, Portsmouth, and Cincinnati.

On referring to Table No. 51, it will be noted that no well marked or consistent divergence is shown in the corresponding numbers of *B. coli* observed in the effluents from the three stages of treatment during the colder season as compared with the warmer season, the deviations indicated being of no greater magnitude than might be expected from two independent series of observations. From these data, as well as from other evidence not here cited, it appears that changes in season do not affect the efficiency of bacterial removal by the Ohio River plants to an extent sufficient to cause any material variation in such efficiency or, consequently, to affect the indicated maximum limit of *B. coli* content of the raw water consistent with producing effluents of specified quality.

RELATION TO MAXIMUM EXPRESSED IN TERMS OF REED'S "MOST PROBABLE NUMBERS"

Reference to Table No. 44 shows that when the *B. coli* data given in Table No. 43 are converted to terms of Reed's most probable numbers, the general order of magnitude of the corresponding *B. coli* figures becomes increased, both in the raw water and in the various effluents. When these figures are plotted on logarithmic scales, as in the preceding series of graphs, a comparison may be made between the maximum *B. coli* index, previously described, and the maximum "most probable numbers" of *B. coli* in the raw water, consistent with producing effluents conforming to the Treasury Department standard. In Figure 31 are shown graphs of the data given in section A of the table, for all of the plants combined. Referring to this chart, it is noted that the line drawn through the plotted points for the final (chlorinated) effluent has an abscissal value of 1,100 *B. coli* per 100 cubic centimeters, corresponding to an ordinate of 1.05, which represents the limiting "most probable numbers" of *B. coli* according to the Treasury Department standard. The figure thus obtained is shown to be considerably lower than the corresponding maximum as derived from *B. coli* data expressed in terms of the *B. coli* index.

LIMITING NUMBERS OF B. COLI IN RAW-WATER CONSISTENT WITH THE PRODUCTION OF UNCHLORINATED EFFLUENTS CONFORMING TO THE UNITED STATES TREASURY DEPARTMENT STANDARD

In the immediately foregoing text, attention has been confined to a discussion of the indicated maximum *B. coli* content of Ohio River water consistent with the production of chlorinated filter effluents conforming to the United States Treasury Department *B. coli* standard. In addition, the question as to what are the maximum numbers of *B. coli* in the river water consistent with producing unchlorinated filter effluents conforming to the same or to some other approved standard is one of considerable practical importance, owing to a trend of opinion among many sanitary officials that chlorination, as ordinarily practiced in connection with water filtration, should be maintained solely as a factor of safety in relation to filtration processes and that requirements as to their bacterial efficiency and maximum permissible raw-water pollution should be based on their performance without the aid of chlorination. It is only fair to state in this connection, however, that other authorities hold the opposite view that to require the production of unchlorinated effluents meeting the Treasury Department standard would impose an unreasonable burden of cost on some water-purification systems and, in general, would involve a failure to take full advantage of the bacterial efficiency of chlorine disinfection under the comparatively favorable conditions which usually are presented by its application to filter effluents of relative clarity. Without entering into any discussion of the controversial aspects of this matter, which lie outside of the scope of the present report, it is proposed to indicate briefly what the data at hand have shown as to the question above noted.

On reference to Figure 32 it is noted that within the range covered by the plotted group averages for the unchlorinated filter effluent, the plot lies entirely above the horizontal line corresponding to the United States Treasury Department standard. This would signify that the 10 Ohio River plants, when considered as a single group, did not produce unchlorinated effluents meeting this standard, even in the lower ranges of raw water *B. coli* content, with sufficient consistency to give a point on the correlation curve having an ordinate as low in its value as the limit fixed by the standard.

A study of the *B. coli* data given in Table No. 39 for the individua plants indicates that but three of these plants—namely, those located at Steubenville, Ashland, and Portsmouth—produced unchlorinated filter effluents containing numbers of *B. coli* less than the limit fixed by the Treasury Department standard with a sufficiently high degree of consistency to give group average figures falling below the limit in question.[32] By combining and averaging the group figures for the unchlorinated effluents of these three plants, corresponding to raw water *B. coli* indices equal to 10, 100, and 1,000 per 100 cubic centimeters, respectively, the following results were obtained:

B. coli index per 100 cubic centimeters

Raw water	Unchlorinated filter effluent
10	0.45
100	1.30
1,000	3.60

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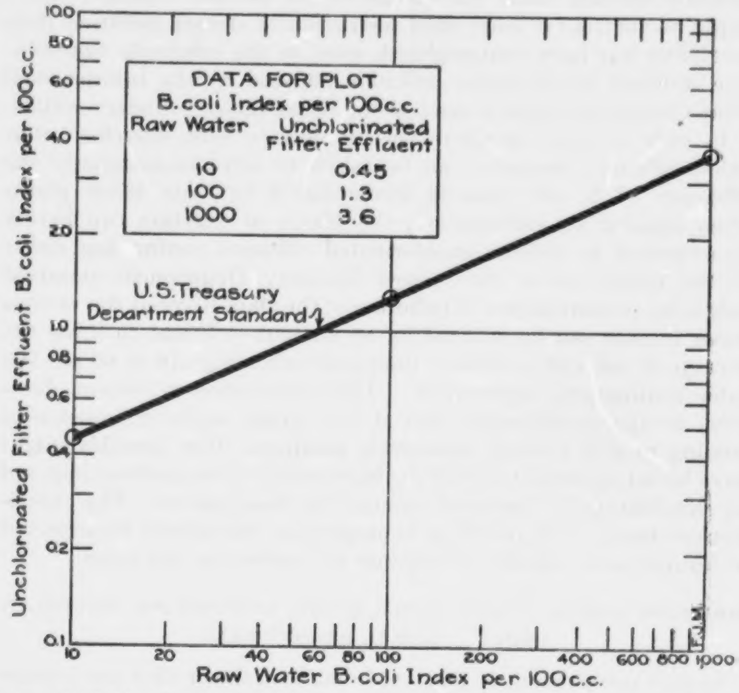
[32] Certain other plants of Group I, notably the one at Ironton, gave decided indications of being able to produce unchlorinated effluents conforming to the Treasury Department standard when sufficiently low amounts of *B. coli* were present in the raw water. Owing, however, to the high degree of raw water pollution at these plants, it was not practicable to observe satisfactorily their performance under the required conditions.

On referring to Figure 34, in which is shown a logarithmic plot of these data, it is noted that the plotted points lie along a straight line and that this line has an abscissal value equal to approximately 60 *B. coli* per 100 cubic centimeters at its point of intersection with the horizontal line corresponding to the limiting *B. coli* index fixed by the Treasury Department standard. On the basis of these observations, therefore, the maximum *B. coli* index of the raw water consistent with producing unchlorinated effluents conforming to the Treasury Department standard would be 60 per 100 cubic centimeters, which figure may be taken as representing the best performance of which the Ohio River plants were capable in this respect under the conditions prevailing in 1924.



Raw Water	Unchlorinated Filter Effluent
10	0.45
100	1.3
1000	3.6

FIG. 34.—Relations between *B. coli* index of raw water and corresponding index of unchlorinated filter effluent, as derived from data from three Ohio River plants. Constants of plot: —(c)=0.16. (n)=0.45

In this connection it is of interest to note that according to the graph in Figure 34 the maximum raw-water *B. coli* index consistent with the production of unchlorinated filter effluents conforming to the former Treasury Department standard, which fixed the upper limit at 2 *B. coli* per 100 cubic centimeters is indicated as being approximately equal to 270 *B. coli* per 100 cubic centimeters, or 4.5 times the maximum which would be imposed by the necessity of meeting the revised standard. It thus is apparent that a very considerable margin of difference would exist in the permissible degrees of raw-water pollution consistent with the production of unchlorinated effluents conforming, respectively, to the former and to the present Treasury Department standards. The indicated raw-water maximum which would be required in order to produce unchlorinated effluents meeting either the former or the present standard would imply, in fact, a far more rigid restriction of stream pollution than heretofore has been contemplated, even in the relatively conservative standard of raw-water pollution adopted by the International Joint Commission with respect to the Great Lakes boundary waters.

In view of these considerations, it may be said, therefore, that unless effective measures can be taken to increase materially the efficiency of *B. coli* removal accomplished by Ohio River plants when unaided by chlorination, the plants in question can hardly be expected to deliver unchlorinated effluents conforming either to the former or to the revised Treasury Department standard unless the present degree of pollution of the Ohio River at the various water intakes can be reduced by an amount sufficient to bring the average *B. coli* index within a limit approximating 270 or 60 per 100 cubic centimeters, respectively. This observation is subject, however, to the qualification that it was made under circumstances tending to give a lower permissible maximum than possibly might have been true were it not for the large extent of dependence imposed on chlorination for bacterial removal by these plants. The experimental studies of the problem in progress at this writing are expected to furnish more specific information as bearing on this point.

INDICATED LIMITS OF RAW WATER B. COLI CONTENT FOR PLANTS OF GROUPS I AND II, RESPECTIVELY

In previous portions of this text it has been shown that the average quality of effluents produced by the plants of Group I, at which two separate stages of preliminary sedimentation are used, was indicated as being consistently better than that of effluents delivered by the plants comprising Group II, at which only a single stage of sedimentation is employed. It likewise has been shown in Table No. 49 that when the numbers of bacteria, or of *B. coli*, occurring in the raw-water supplies of the two respective groups of plants were correlated with the numbers observed coincidently in their effluents, the over-all efficiencies of bacterial removal, with given numbers of bacteria in the raw water, were found to be measurably greater for the plants of Group I than for those of Group II. It thus is apparent that the maximum permissible number of *B. coli* in the raw water, consistent with producing effluents of specified quality, would be expected to be measurably higher for the plants of Group I than for those of Group II.

The maximum numbers in question, with chlorination included, can be computed readily from the respective values of (c) and (n) for the two groups of plants as given on page 133, using the formula: $E=cR^n$. When (E) is assumed as equal to the limit fixed by the Treasury Department standard, the value of (R) for the plants of Group I is equal to 60,400 *B. coli* per 100 cubic centimeters and for plants of Group II, 730 per 100 cubic centimeters.

The disparity between these two figures is so wide as to suggest that they may be influenced to some extent by possible errors resulting from the extreme flatness of the correlation plots from which the respective values of (c) and (n) for the two groups have been derived.[33] A study of the graph, in Figure 30, based on the *B. coli* data for the two groups of plants combined, shows, for example, that the position of the point of intersection of the plot with the horizontal line corresponding to the Treasury Department standard would be influenced greatly by comparatively small errors either in the value of (c) or in that of the slope (n). For this reason the limiting maxima above stated must be accepted with due allowance for the source of possible error noted, though it may be pointed out in this connection that the corresponding *B. coli* maximum derived from data obtained from the two groups of plants combined, which appears to be a rational value for a reason previously stated,[34] is subject to a similar source of error.

Frequency Variations in Bacterial Quality of Raw Waters and Effluents.

In the foregoing section of the text the variations observed in the quality of the different raw waters and effluents have been discussed from a standpoint of their mutual correlations. It is now proposed to decribe the variations which were observed in the quality of both raw water and effluents when considered in reference to their mean and modal values over stated periods and under given conditions. On referring to the tables in Appendix B, giving the results of daily observations, it is noted that the numbers of bacteria observed in the raw waters and several effluents are shown to vary widely in reference to their monthly means. In Table No. 52 are shown the percentages of the individual daily samples giving bacterial counts falling within specified ranges of ascending magnitude, the three tables being derived, respectively, from the 48-hour, 20° C. counts, the 24-hour, 37° C. count, and the *B. coli* index.

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[33] The reasons for the relative flatness of the plots based on the *B. coli* results obtained in both the unchlorinated and the chlorinated effluents of the several plants have been discussed previously.

[34] See footnote, p. 137.

Table No. 52.—*Percentages of total samples giving bacterial counts falling within specified ranges*

A. 48-HOUR AGAR COUNT, 20° C.

RAW WATER

Plant	Bacterial count per cubic centimeter, ranging from—										
	0-100	101-200	201-400	401-800	801-1,600	1,601-3,200	3,201-6,400	6,401-12,800	12,801-25,600	25,601-51,200	Over 51,200
Steubenville	5.8	6.6	11.6	19.8	14.1	28.1	10.7	3.3	......	......	......
Ironton	......	......	......	......	1.4	8.9	20.2	20.6	22.6	17.1	9.2
Portsmouth	......	......	......	1.9	13.4	16.1	25.7	21.6	12.0	7.9	1.4
Cincinnati	2.2	4.6	5.5	6.6	8.8	14.8	12.6	14.8	7.4	11.2	11.5
Louisville	......	.3	.7	2.1	3.5	7.0	15.7	21.0	29.8	18.9	1.0
Evansville	......	......	2.5	10.7	11.5	13.4	15.8	15.0	12.6	12.0	6.5

PRIMARY SETTLED WATER

Plant	Bacterial count per cubic centimeter, ranging from—								
	0-50	51-100	101-200	201-400	401-800	801-1,600	1,601-3,200	3,201-6,400	Over 6,400
Steubenville	1.7	3.3	4.1	18.2	19.8	16.5	19.8	14.9	1.7
Ironton	.4	1.1	3.9	14.2	19.8	26.1	18.3	12.7	3.5
Portsmouth	......	.8	3.9	15.3	25.4	29.0	18.7	6.1	.8
Cincinnati	.5	4.4	8.8	11.2	19.9	16.7	10.9	14.5	13.1
Louisville	......	.6	......	1.8	4.6	6.7	15.5	21.8	49.0

APPLIED TO FILTERS

Plant	Bacterial count per cubic centimeter, ranging from—									
	0-25	26-50	51-100	101-200	201-400	401-800	801-1,600	1,601-3,200	3,201-6,400	Over 6,400
Steubenville	5.0	5.8	8.3	19.8	19.0	26.4	13.2	1.7	0.8	......
Ironton	.4	2.8	19.1	21.6	16.2	23.3	12.0	3.5	1.1	......
Portsmouth	.3	.3	2.4	12.6	24.6	26.7	22.4	10.4	.3	......
Cincinnati	3.0	6.0	20.5	20.5	18.3	10.4	16.1	4.9	.3	......
Louisville	......	.4	3.0	7.5	14.6	36.7	30.3	7.1	.4	......
Evansville	......	2.2	5.2	12.9	22.2	20.0	13.7	13.7	6.3	3.8

FILTERED—UNCHLORINATED

Plant	Bacterial count per cubic centimeter, ranging from—									
	0-1	2-4	5-8	9-16	17-32	33-64	65-128	129-256	257-512	Over 512
Steubenville	9.1	2.5	0.8	6.6	11.6	12.4	9.9	14.1	19.8	13.2
Ironton	14.9	16.6	15.9	18.0	9.4	11.5	6.7	2.5	1.1	.4
Portsmouth	1.9	2.7	6.3	15.9	19.4	18.0	17.5	12.0	6.3	......
Cincinnati	7.9	19.1	9.8	11.5	10.1	10.4	11.8	13.1	6.0	.3
Louisville	......	......	......	......	1.2	8.5	17.9	22.2	13.1	37.1

FILTERED—CHLORINATED

Steubenville	47.4	15.8	4.2	6.7	6.7	4.2	3.3	1.7	7.5	2.5
Ironton	50.1	29.9	10.2	4.9	2.4	2.1	.4	......	......	......
Portsmouth	90.0	5.7	2.7	1.6	......	......	......	......	......	......
Cincinnati	33.3	30.9	10.3	4.4	5.2	2.7	4.4	4.9	3.6	.3
Louisville	12.8	21.3	23.4	27.8	9.8	3.4	.9	.3	.3	......
Evansville	14.2	51.6	23.2	10.7	......	.3	......	......	......	......

Table No. 52.—*Percentages of total samples giving bacterial counts falling within specified ranges*—Continued

B. 24-HOUR AGAR COUNT, 37° C.

RAW WATER

Plant	Bacterial count per cubic centimeter, ranging from—								
	0-100	101-200	201-400	401-800	801-1,600	1,601-3,200	3,201-6,400	6,401-12,800	Over 12,800[1]
East Liverpool	2.4	3.6	6.6	11.3	12.2	24.6	21.1	11.6	6.6
Steubenville	36.3	18.1	15.9	8.8	7.7	8.6	3.7	.9	
Huntington	4.9	10.5	6.9	20.9	24.8	19.6	10.5	1.9	
Ashland	.9	5.1	17.4	25.9	34.1	13.8	2.2	.6	
Ironton				5.5	18.6	33.6	27.0	10.9	4.4
Portsmouth	.5	3.3	12.3	25.1	35.0	15.6	7.4	.8	
Cincinnati	24.0	16.7	13.2	14.5	15.1	10.6	4.5	.6	.8
Louisville	1.2	.9	5.4	16.3	35.5	24.1	13.6	2.7	.3
Evansville				3.0	20.5	31.4	24.3	17.8	3.0
Henderson					8.7	39.1	35.3	10.9	6.0

PRIMARY SETTLED

Plant	Bacterial count per cubic centimeter, ranging from—								
	0-50	51-100	101-200	201-400	401-800	801-1,600	1,601-3,200	3,201-6,400	Over 6,400
Steubenville	35.6	22.3	14.4	11.8	7.8	2.7	2.4	2.7	0.3
Ironton	2.6	9.5	26.0	29.7	21.2	6.9	2.6	1.1	.4
Portsmouth	18.1	20.9	15.4	27.4	14.0	4.2			
Cincinnati	31.0	17.3	19.3	17.3	8.7	5.0	1.4		

APPLIED TO FILTERS

Plant	Bacterial count per cubic centimeter, ranging from –								
	0-25	26-50	51-100	101-200	201-400	401-800	801-1,600	1,601-3,200	Over 3,200
East Liverpool	6.1	6.4	9.7	14.0	20.1	12.5	19.4	9.4	2.4
Steubenville	64.2	15.2	6.1	5.4	3.4	4.5	1.2		
Huntington	4.9	7.5	12.7	16.3	23.5	18.2	11.7	4.9	.3
Ashland	10.8	22.8	26.3	27.8	7.6	4.4	.3		
Ironton	10.8	23.4	33.4	20.1	8.3	2.9	.7	.4	
Portsmouth	15.0	21.1	17.5	18.3	19.7	7.9	.5		
Cincinnati	48.1	18.7	17.4	7.6	4.8	3.1	.3		
Evansville		.8	5.7	21.8	26.1	15.3	21.0	8.5	.8
Henderson				3.4	12.6	42.3	32.6	7.4	1.7

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[1] Supplementary raw-water classification:

	0-25	26-50	51-100	12,801-25,600	25,601-51,200	Over 51,200
Steubenville	11.1	11.1	14.1			
Cincinnati	3.0	7.0	14.0			
East Liverpool				5.1	1.5	0
Ironton				2.2	2.2	.0
Evansville				1.9	.8	.3
Henderson				3.3	2.7	.0

TABLE No. 52.—*Percentages of total samples giving bacterial counts falling within specified ranges*—Continued

B. 24-HOUR AGAR COUNT, 37° C—Continued

FILTERED—UNCHLORINATED

Plant	Bacterial count per cubic centimeter, ranging from—									
	0-1	2-4	5-8	9-16	17-32	33-64	65-128	129-256	257-512	Over 512
East Liverpool	7.6	11.3	8.9	6.4	10.1	8.3	11.6	13.5	14.1	8.2
Steubenville	45.3	23.5	6.9	3.9	4.8	3.9	4.2	3.6	2.1	1.8
Huntington	9.4	20.1	19.2	21.1	14.3	14.3	1.6	------	------	------
Ashland	26.8	29.0	18.3	11.4	8.5	2.9	1.9	.9	.3	------
Ironton	47.0	21.4	12.3	12.3	4.9	------	1.7	.4	------	------
Portsmouth	57.3	10.1	5.2	8.5	11.5	6.3	1.1	------	------	------
Cincinnati	41.6	30.5	9.5	11.4	2.5	3.6	.3	.3	.3	------
Henderson	------	2.2	8.9	24.4	26.7	15.0	10.0	5.0	6.1	1.7

FILTERED—CHLORINATED

Plant	0-1	2-4	5-8	9-16	17-32	33-64	65-128	129-256	257-512	Over 512
East Liverpool	59.5	21.7	5.2	2.4	3.7	2.4	0.9	1.8	1.8	0.6
Steubenville	82.2	13.9	1.5	1.8	.3	------	.3	------	------	------
Huntington	53.9	41.3	4.2	.6	------	------	------	------	------	------
Ashland	77.0	19.6	2.8	.3	.3	------	------	------	------	------
Ironton	71.6	18.5	7.7	1.8	.4	------	------	------	------	------
Portsmouth	99.7	.3	------	------	------	------	------	------	------	------
Cincinnati	61.5	13.5	4.8	2.8	3.4	4.8	2.5	3.1	1.4	2.2
Louisville	31.6	29.4	17.3	13.9	3.6	2.1	1.2	.6	.3	------
Evansville	12.6	39.6	24.1	16.9	4.1	2.7	------	------	------	------
Henderson	1.6	37.5	45.1	7.6	5.4	1.6	.6	.6	------	------

C. B. COLI INDEX

RAW WATER

Plant	Total samples tested	Number of samples giving index of—					Per cent of samples giving index of—				
		10	100	1,000	10,000	100,000	10	100	1,000	10,000	100,000
East Liverpool	471	54	222	138	57	0	11.5	47.1	29.3	12.1	0.0
Steubenville	397	223	128	37	9	0	56.2	32.2	9.3	2.3	0
Huntington	610	------	296	272	42	0	------	48.6	44.6	6.8	0
Ashland	748	------	310	258	125	55	------	41.5	34.4	16.7	7.4
Ironton	509	------	52	205	252	0	------	10.2	40.3	49.5	0
Portsmouth	719	------	305	330	84	0	------	42.4	45.9	11.7	0
Cincinnati	627	------	330	225	64	8	------	52.7	35.9	10.2	1.2
Louisville	869	347	262	201	55	4	39.9	30.2	23.1	6.3	.5
Evansville	1,300	------	636	494	170	0	------	48.9	38.0	13.1	0
Henderson	362	------	181	168	13	0	------	50.0	46.4	3.6	0

PRIMARY SETTLED

Plant	Total samples tested	10	100	1,000	10,000	100,000	10	100	1,000	10,000	100,000
Steubenville	172	98	47	18	6	3	56.8	27.4	10.5	3.5	1.8
Ironton	583	------	125	192	266	0	------	21.5	32.9	45.6	0
Portsmouth	625	209	328	88	0	0	33.4	52.5	14.1	0	0
Cincinnati	401	------	291	91	19	0	------	72.7	22.6	4.7	0
Louisville	737	299	264	145	29	0	40.6	35.8	19.7	3.9	0

Table No. 52.—*Percentages of total samples giving bacterial counts falling within specified ranges*—Continued

C. B. COLI INDEX—Continued

APPLIED TO FILTERS

Plant	Total samples tested	Number of samples giving index of—				Per cent of samples giving index of—			
		10	100	1,000	10,000	10	100	1,000	10,000
East Liverpool	454	82	239	109	24	18.1	52.6	24.0	5.3
Steubenville	117	81	30	6	0	69.3	25.6	5.1	0
Ashland	659	275	229	117	38	41.8	34.7	17.7	5.8
Ironton	539	30	232	277	0	5.6	43.0	51.4	0
Portsmouth	570	335	204	31	0	58.8	35.8	5.4	0
Cincinnati	504	325	151	28	0	64.5	29.9	5.6	0
Louisville	468	267	177	24	0	57.1	37.7	5.2	0
Henderson	274	--------	171	97	6	--------	62.4	35.4	2.2

FILTERED—UNCHLORINATED

Plant	Total samples tested	Number of samples giving index of—						Per cent of samples giving index of—					
		0	2	4	6	8	10	0	2	4	6	8	10
East Liverpool	338	119	52	41	31	27	68	35.2	15.4	12.1	9.2	8.0	20.1
Steubenville	337	290	22	10	6	4	5	86.1	6.6	2.9	1.8	1.2	1.4
Ashland	317	141	38	31	23	16	68	44.5	12.0	9.9	7.2	5.0	21.4
Ironton	295	174	65	25	9	5	17	59.0	22.1	8.5	3.0	1.6	5.8
Portsmouth	366	236	69	32	14	3	12	64.4	18.8	8.7	4.1	.8	3.2
Cincinnati	366	153	79	58	30	23	23	41.9	21.7	15.8	8.2	6.2	6.2
Louisville	366	84	26	23	46	58	129	23.0	7.1	6.3	12.6	15.8	35.2
Henderson	178	19	49	45	29	23	13	10.7	27.5	25.3	16.3	12.9	7.3

FILTERED—CHLORINATED

East Liverpool	332	209	46	23	11	10	33	62.9	13.9	6.9	3.3	3.0	10.0
Steubenville	335	311	17	3	2	1	1	92.9	5.1	.8	.6	.3	.3
Huntington	310	272	8.	9	2	6	13	87.7	2.5	2.9	.6	1.9	4.4
Ashland	317	307	8	1	0	0	1	96.9	2.5	.3	0	0	.3
Ironton	297	285	12	0	0	0	0	96.0	4.0	0	0	0	0
Portsmouth	366	366	0	0	0	0	0	100.0		0	0	0	0
Cincinnati	364	338	14	7	3	0	2	92.9	3.8	1.9	.8	0	.6
Louisville	366	356	8	1	0	0	1	97.2	2.2	.3	0	0	.3
Evansville	366	352	11	2	1	0	0	96.1	3.2	.5	.2	0	0
Henderson	189	159	23	3	3	1	0	84.1	12.2	1.6	1.6	.5	0

A mere inspection of the figures given in these tables shows that the bacterial counts observed at various stages of purification have a tendency to be distributed roughly in accordance with crested frequency curves similar in their characteristics to those which are familiar to students of biometrical phenomena. In Figure 35 are shown examples of the types of curves defined by these figures, it being noted that in every instance the curve is of the "skew" type. If the abscissæ of these curves, representing the mid-points of the bacterial count ranges, be plotted on logarithmic rather than on linear scales, curves such as are shown in Figure 36 are obtained. These curves, it will be noted, are almost symmetrical about their modes, approaching closely those of the so-called "normal frequency" type in this respect.

In addition to the graphical evidences above cited concerning the skewness of the frequency distributions formed by the bacterial counts observed at various stages of treatment and the comparatively symmetrical nature of these distributions when the logarithms of the bacterial counts are plotted in the form of a frequency curve,

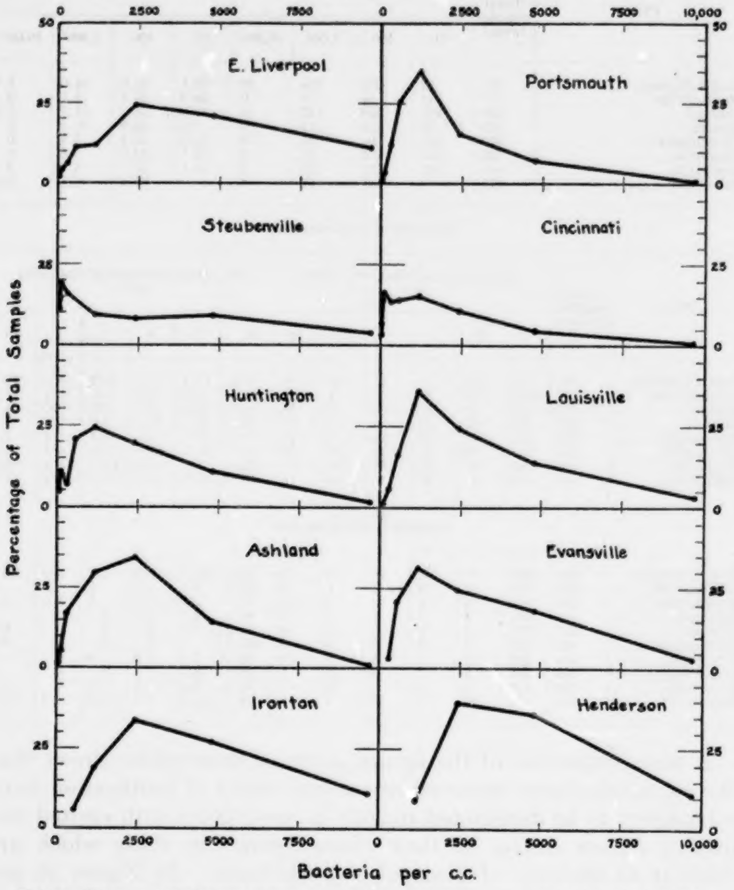

FIG. 35.—Frequency plot of raw-water counts, 24 hours at 37° C., observed at each of the 10 Ohio River plants during the period of observations. (Plot of data given in Table No. 52b)

a rough statistical measure of the comparative symmetry of these distributions is afforded by a simple test for skewness given by Bowley.[35] According to this test, if the items forming a frequency distribution be arranged in the order of their magnitude and if the quantity (q_2) indicate the excess of the upper quartile over the median and (q_1) the excess of the median over the lower quartile then the skewness (S) equals

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[35] Bowley, Arthur L., Elements of Statistics, Pt. I, p. 116. (4th edition, 1920).

$$\frac{q_2 - q_1}{q_2 + q_1}$$

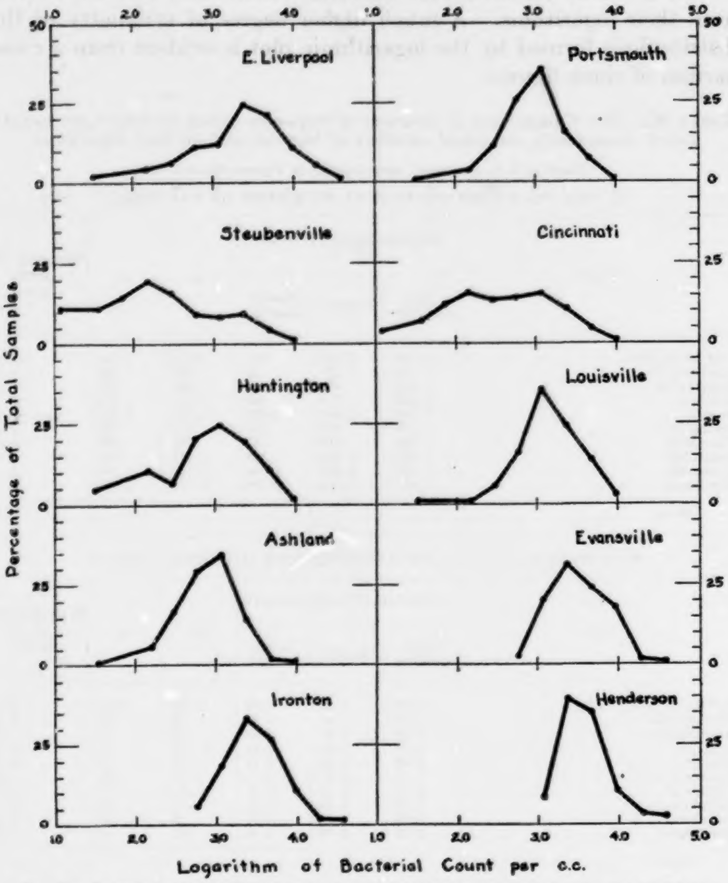

FIG. 36.—Replot of curves shown in Figure 35, with logarithms of raw-water counts as abscissae

If a frequency distribution is of perfect symmetry (that is, normal) the quantity (S) will be equal to zero. If skewness exists, (S) will be greater than zero and not more than unity. Bowley states that a value of (S) equal to 0.1 indicates moderate skewness; of 0.3, considerable skewness. In Table No. 53, values of the skewness (S) have been tabulated for the 37° C. bacterial count distributions for the raw waters of the various plants as given in Table No. 52. The quartiles and medians for computation were taken from ogive plots of the logarithmic distributions, and from similar plots of the distributions according to actual bacterial counts. On referring to Table No. 53 it is noted that the mean skewness of the distributions is 0.33 as based on the actual bacterial counts and 0.07 as derived from their logarithms. A much higher degree of symmetry of the distributions formed by the logarithmic plot is evident from a comparison of these figures.

TABLE No. 53.—*Comparison of skewness of frequency curves for raw-water counts, based, respectively, on actual numbers of bacteria and on their logarithms*

(Derived from frequency curves shown in Figures 37a and 37b)

A. CURVES BASED ON ACTUAL NUMBERS OF BACTERIA

Plant	Bacterial counts, 24 hours, 37° C.			q_2	q_1	Skewness (S)[1] $=\frac{q_2-q_1}{q_2+q_1}$
	Upper quartile	Median	Lower quartile			
East Liverpool	5,010	2,340	831	2,670	1,510	+0.27
Steubenville	563	178	59	385	119	+.53
Huntington	1,950	934	447	1,020	487	+.35
Ashland	1,260	794	408	466	386	+.09
Ironton	4,790	2,630	1,620	2,160	1,010	+.36
Portsmouth	1,550	932	550	618	382	+.24
Cincinnati	1,050	316	107	732	209	+.56
Louisville	2,460	1,350	813	1,110	537	+.35
Evansville	5,630	2,890	1,740	2,740	1,150	+.41
Henderson	5,630	3,800	2,520	1,830	1,280	+.18
Mean						+.33

B. CURVES BASED ON LOGARITHMS OF BACTERIAL COUNTS

Plant	Logarithms of bacterial counts			q_2	q_1	Skewness (S)[1] $=\frac{q_2-q_1}{q_2+q_1}$
	Upper quartile	Median	Lower quartile			
East Liverpool	3.70	3.37	2.92	0.33	0.45	−0.15
Steubenville	2.75	2.23	1.77	.52	.46	+.06
Huntington	3.29	2.97	2.65	.32	.32	.00
Ashland	3.10	2.90	2.61	.30	.29	+.02
Ironton	3.68	3.43	3.21	.25	.22	+.06
Portsmouth	3.19	2.97	2.74	.22	.23	−.02
Cincinnati	3.02	2.50	2.03	.52	.47	+.05
Louisville	3.39	3.13	2.91	.26	.22	+.08
Evansville	3.75	3.47	3.24	.28	.23	+.10
Henderson	3.75	3.58	3.40	.17	.18	−.03
Mean						+.07

[1] Reference: Bowley, Arthur L., Elements of Statistics, Pt. I, p. 116 (P. S. King & Son (Ltd.), London, England).

In Table No. 54, the figures in the preceding three tables have been combined in such a way as to show the percentages of the total numbers of samples giving bacterial counts exceeding the upper limits of the respective ranges given in the preceding tables. Each percentage figure, it will be noted, has been derived by adding together the percentages of counts falling within all ranges of magnitudes higher than the particular count to which it is referred. The distributions formed by these percentages are "cumulatives" or "ogives" of those which are given in the preceding tables and illustrated in Figures 35 and 36.

TABLE NO. 54.—*Percentages of total samples giving bacterial counts higher than specified numbers*

A. 48-HOUR AGAR COUNT, 20° C.

RAW WATER

Plant	Bacterial count per cubic centimeter										
	0	100	200	400	800	1,600	3,200	6,400	12,800	25,600	51,200
Steubenville	100.0	94.2	87.6	76.0	56.2	42.1	14.0	3.3			
Ironton					100.0	98.6	89.7	69.5	48.9	26.3	9.2
Portsmouth				100.0	98.1	84.7	68.6	42.9	21.3	9.3	1.4
Cincinnati	100.0	97.8	93.2	87.7	81.1	72.3	57.5	44.9	30.1	22.7	11.5
Louisville		100.0	99.7	99.0	96.9	93.4	86.4	70.7	49.7	19.9	1.0
Evansville			100.0	97.5	86.8	75.3	61.9	46.1	31.1	18.5	6.5

PRIMARY SETTLED WATER

Plant	Bacterial count per cubic centimeter								
	0	50	100	200	400	800	1,600	3,200	6,400
Steubenville	100.0	98.3	95.0	90.9	72.7	52.9	36.4	16.6	1.7
Ironton	100.0	99.6	98.5	94.6	80.4	60.6	34.5	16.2	3.5
Portsmouth		100.0	99.2	95.3	80.0	54.6	25.6	6.9	.8
Cincinnati	100.0	99.5	95.1	86.3	75.1	55.2	38.5	27.6	13.1
Louisville			100.0	99.4	97.6	93.0	86.3	70.8	49.0

APPLIED TO FILTERS

Plant	Bacterial count per cubic centimeter									
	0	25	50	100	200	400	800	1,600	3,200	6,400
Steubenville	100.0	95.0	89.2	80.9	61.1	42.1	15.7	2.5	0.8	
Ironton	100.0	99.6	96.8	77.7	56.1	39.9	16.6	4.6	1.1	
Portsmouth	100.0	99.7	99.4	97.0	84.4	59.8	33.1	10.7	.3	
Cincinnati	100.0	97.0	91.0	70.5	50.0	31.7	21.3	5.2	.3	
Louisville			100.0	99.6	96.6	89.1	74.5	37.8	7.5	0.4
Evansville		100.0	97.8	92.6	79.7	57.5	37.5	23.8	10.1	3.8

FILTERED—UNCHLORINATED

Plant	Bacterial count per cubic centimeter									
	0	2	4	8	16	32	64	128	256	512
Steubenville	100.0	90.9	88.4	87.6	81.0	69.4	57.0	47.1	33.0	13.2
Ironton	100.0	85.1	68.5	52.6	34.6	25.2	10.7	4.0	1.5	.4
Portsmouth	100.0	98.2	95.5	89.0	73.3	53.8	35.8	18.3	6.3	
Cincinnati	100.0	92.1	73.0	63.2	51.7	41.6	31.2	19.4	6.3	.3
Louisville					100.0	98.8	90.3	72.4	50.2	37.1

FILTERED—CHLORINATED

Steubenville	100.0	52.6	36.8	32.6	25.9	19.2	15.0	11.7	10.0	2.5
Ironton	100.0	49.9	20.0	9.8	4.9	2.5	.4			
Portsmouth	100.0	10.0	4.3	1.6						
Cincinnati	100.0	66.7	35.8	25.5	21.1	15.9	13.2	8.8	3.9	.3
Louisville	100.0	87.2	65.9	42.5	14.7	4.9	1.5	.6	.3	
Evansville	100.0	85.8	34.2	11.0		.3				

Table No. 54.—*Percentages of total samples giving bacterial counts higher than specified numbers*—Continued

B. 24-HOUR AGAR COUNT, 37° C.

RAW WATER

Plant	Bacterial count per cubic centimeter												
	0	25	50	100	200	400	800	1,600	3,200	6,400	12,800	25,600	51,200
East Liverpool	100.0	------	------	97.6	94.0	87.4	76.1	63.9	39.3	18.2	6.6	1.5	0
Steubenville	100.0	88.9	77.8	63.7	45.6	29.7	20.9	13.2	4.6	.9	------	------	------
Huntington	100.0	------	------	95.1	84.6	77.7	56.8	32.0	12.4	1.9	------	------	------
Ashland	100.0	------	------	99.1	94.0	76.6	50.7	16.6	2.8	.6	------	------	------
Ironton	------	------	------	------	------	100.0	94.5	75.9	42.3	15.3	4.4	2.2	0
Portsmouth	100.0	------	------	99.5	96.2	83.9	58.8	23.8	8.2	.8	------	------	------
Cincinnati	100.0	97.0	90.0	76.0	59.3	46.1	31.6	16.5	5.9	1.4	.8	------	------
Louisville	100.0	------	------	98.8	97.9	92.5	76.2	40.7	16.6	3.0	.3	------	------
Evansville	------	------	------	------	------	100.0	97.0	76.5	45.1	20.8	3.0	1.1	.3
Henderson	------	------	------	------	------	------	100.0	91.3	52.2	16.9	6.0	2.7	0

PRIMARY SETTLED WATER

Plant	Bacterial count per cubic centimeter								
	0	50	100	200	400	800	1,600	3,200	6,400
Steubenville	100.0	64.4	42.1	27.7	15.9	8.1	5.4	3.0	0.3
Ironton	100.0	97.4	87.9	61.9	32.2	11.0	4.1	1.5	.4
Portsmouth	100.0	81.9	61.0	45.6	18.2	4.2	------	------	------
Cincinnati	100.0	69.0	51.7	32.4	15.[illegible]	6.[illegible]	1.4	------	------

APPLIED TO FILTERS

Plant	Bacterial count per cubic centimeter								
	0	25	50	100	200	400	800	1,600	3,200
East Liverpool	100.0	93.9	87.5	77.8	63.8	43.7	31.2	11.8	2.4
Steubenville	100.0	35.8	20.6	14.5	9.1	5.7	1.2	------	------
Huntington	100.0	95.1	87.6	74.9	58.6	35.1	16.9	5.2	.3
Ashland	100.0	89.2	66.4	40.1	12.3	4.7	.3	------	------
Ironton	100.0	89.2	65.8	32.4	12.3	4.0	1.1	.4	------
Portsmouth	100.0	85.0	63.9	46.4	28.1	8.4	.5	------	------
Cincinnati	100.0	51.9	33.2	15.8	8.2	3.4	.3	------	------
Evansville	------	100.0	99.2	93.5	71.7	45.6	30.3	9.3	.8
Henderson	------	------	------	100.0	96.6	84.0	41.7	9.1	1.7

FILTERED—UNCHLORINATED

Plant	Bacterial count per cubic centimeter									
	0	2	4	8	16	32	64	128	256	512
East Liverpool	100.0	92.4	81.1	72.2	65.8	55.7	47.4	35.8	22.3	8.2
Steubenville	100.0	54.7	31.2	24.3	20.4	15.6	11.7	7.5	3.9	1.8
Huntington	100.0	90.6	70.5	51.3	30.2	15.9	1.6	------	------	------
Ashland	100.0	73.2	44.2	25.9	14.5	6.0	3.1	1.3	.3	------
Ironton	100.0	53.0	31.6	19.3	7.0	------	2.1	.4	------	------
Portsmouth	100.0	42.7	32.6	27.4	18.9	7.4	1.1	------	------	------
Cincinnati	100.0	58.4	27.9	18.4	7.0	4.5	.9	.6	.3	------
Henderson	------	100.0	97.8	88.9	64.5	37.8	22.8	12.8	7.8	1.7

Table No. 54.—*Percentages of total samples giving bacterial counts higher than specified numbers*—Continued

B. 24-HOUR AGAR COUNT, 37° C—Continued

FILTERED—CHLORINATED

Plant	Bacterial count per cubic centimeter									
	0	2	4	8	16	32	64	128	126	512
East Liverpool	100.0	40.5	18.8	13.6	11.2	7.5	5.1	4.2	2.4	0.6
Steubenville	100.0	17.8	3.9	2.4	.6		.3			
Huntington	100.0	46.1	4.8	.6						
Ashland	100.0	23.0	3.4	.6	.3					
Ironton	100.0	28.4	9.9	2.2	.4					
Portsmouth	100.0	.3								
Cincinnati	100.0	38.5	25.0	20.2	17.4	14.0	9.2	6.7	3.6	2.2
Louisville	100.0	68.5	39.1	21.8	7.9	4.2	2.1	.9	.3	
Evansville	100.0	87.4	47.8	23.7	6.8	2.7				
Henderson	100.0	98.4	60.9	15.8	8.2	2.8	1.2	.5		

C. B. COLI INDEX PER 100 C. C.

RAW WATER

Plant	Total samples tested	Per cent giving B. coli index equal to or exceeding—				
		10	100	1,000	10,000	100,000
East Liverpool	471	100.0	88.5	41.4	12.1	0
Steubenville	397	100.0	43.8	11.6	2.3	0
Huntington	610		100.0	51.4	6.8	0
Ashland	748		100.0	58.5	24.1	7.4
Ironton	509		100.0	89.8	49.5	0
Portsmouth	719		100.0	57.6	11.7	0
Cincinnati	627		100.0	47.3	11.4	1.2
Louisville	869	100.0	60.1	29.9	6.8	0.5
Evansville	1,300		100.0	51.1	13.1	0
Henderson	362		100.0	50.0	3.6	0

PRIMARY SETTLED

Plant	Total samples tested	10	100	1,000	10,000	100,000
Steubenville	172	100.0	43.2	15.8	5.3	1.8
Ironton	583		100.0	78.5	45.6	0
Portsmouth	625	100.0	66.6	14.1	0	0
Cincinnati	401		100.0	27.3	4.7	
Louisville	737	100.0	59.4	23.6	3.9	

APPLIED TO FILTERS

Plant	Total samples tested	10	100	1,000	10,000	100,000
East Liverpool	454	100.0	81.9	29.3	5.3	0
Steubenville	117	100.0	30.7	5.1	0	0
Ashland	659	100.0	58.2	23.5	5.8	0
Ironton	539	100.0	94.4	51.4	0	0
Portsmouth	570	100.0	41.2	5.4	0	0
Cincinnati	504	100.0	35.5	5.6	0	0
Louisville	468	100.0	42.9	5.2	0	0
Henderson	274		100.0	37.6	2.2	0

TABLE NO. 54.—*Percentages of total samples giving bacterial counts higher than specified numbers*—Continued

C. B. COLI INDEX PER 100 C. C.—Continued

FILTERED—UNCHLORINATED

Plant	Total samples tested	Per cent giving B. coli index equal to or exceeding—				
		2	4	6	8	10
East Liverpool	338	64.8	49.4	37.3	28.1	20.1
Steubenville	337	13.9	7.3	4.4	2.6	1.4
Ashland	317	55.5	43.5	33.7	26.5	21.4
Ironton	295	41.0	18.9	10.4	7.4	5.8
Portsmouth	366	35.6	16.8	8.1	4.0	3.2
Cincinnati	366	58.1	36.4	20.6	12.4	6.2
Louisville	366	77.0	69.9	63.6	51.0	35.2
Henderson	178	89.3	61.8	36.5	20.2	7.3
FILTERED—CHLORINATED						
East Liverpool	332	37.1	23.2	16.3	13.0	10.0
Steubenville	335	7.1	2.0	1.2	.6	.3
Huntington	310	12.3	9.8	6.9	6.3	4.4
Ashland	317	2.5	.6	.3	.3	.3
Ironton	297	4.0	0	0	0	0
Portsmouth	366	[1] 0	0	0	0	0
Cincinnati	364	7.1	3.3	1.4	.6	.6
Louisville	366	2.8	.6	.3	.3	3
Evansville	366	3.9	.7	.2	0	0
Henderson	189	15.9	3.7	2.1	.5	0

[1] 1.6 per cent of samples gâve index=1. (Ten 10 c. c. portions cultured from each sample.)

In Figure 37 are shown plots of the percentages of the 24-hour, 37° C. raw-water counts (Table No. 54) exceeding various magnitudes, the plots being constructed on scales similar to those given in Hazen's "probability paper."[36] The decidedly straight-line trend of the plots gives a further indication of the tendency of the bacterial counts in the several raw waters to form "normal" frequency distributions when converted to their logarithmic functions. An interesting characteristic of these plots is their well-marked parallelism with reference to each other, indicating that the numbers of bacteria occurring in the different raw waters have a tendency to undergo about the same degree of proportionate variation, irrespective of the magnitudes of the respective ranges within which such variations occur. This tendency is further evidenced by the general trend toward uniformity of the frequency curves shown in Figure 37 with respect to their shapes and relative degrees of sharpness. On referring to Figure 37, it is noted that the only two curves showing any marked divergence from the remaining ones in respect to their shape are derived from data for the two plants (i. e., Steubenville and Cincinnati), which in Figure 36 give plots deviating most widely from the others in respect to their slopes.

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[36] The "probability paper" was devised by Allen Hazen and described by him in an article entitled, "Storage to be provided in impounding reservoirs," which was published in the Transactions of the American Society of Civil Engineers, vol. 77 (1914), beginning with p. 1539. The horizontal scale of this paper is measured symmetrically on both sides of a vertical center line representing 50 per cent of the observations. The divisions, measured in both directions from the center line, are proportional to values of the function, x/r, corresponding to various percentages defined by the probability integral (see Merriman's "Method of least squares," Table II, p. 221). The property of this ingeniously devised scale is such that if a particular frequency distribution is of the "normal," or symmetrical type, its "ogive" will plot in the form of a straight line on the scale. A distribution of the "skew," or nonsymmetrical type, will plot in the form of an S shaped curve. If some particular function of such a distribution (as, for example, a logarithmic one of the kind illustrated in figs. 35 and 36) is of "normal" shape, a plot of this function on the "probability paper" will follow a straight-line trend.

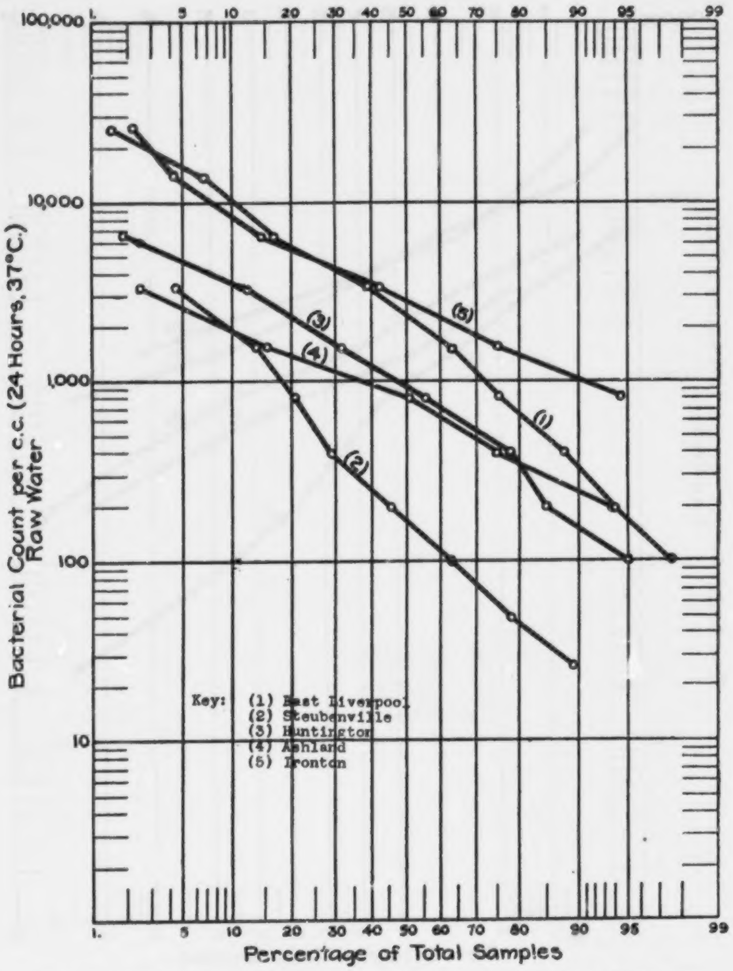

FIG. 37a.—Logarithmic probability plot showing the frequencies with which the bacterial content of the raw waters of designated Ohio River plants equaled or exceeded various amounts. (Plot of data given in Table No. 54b)

In Figure 38 are graphs, drawn in the same manner as in the preceding two charts, showing plots of the frequencies with which the numbers of bacteria observed at the Ironton plant in the raw water and in the effluent from each successive stage of treatment exceeded various magnitudes.[37] In both charts a decided tendency toward mutual parallelism in the slopes of the different lines is apparent.[38]

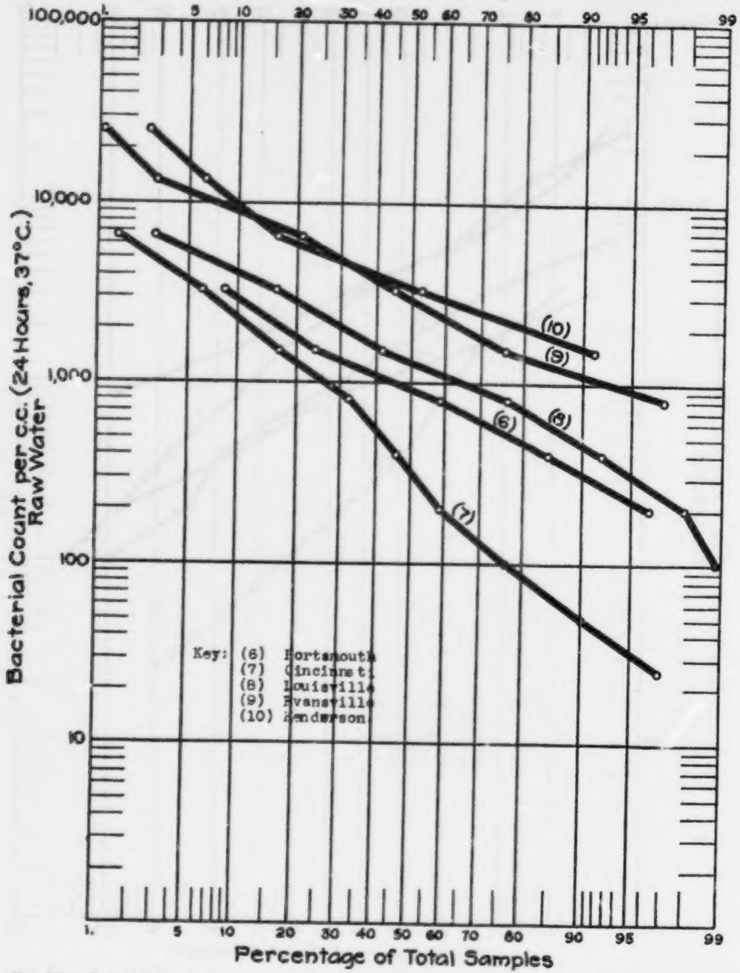

FIG. 37b.—Logarithmic probability plot showing the frequencies with which the bacterial content of the raw waters of designated Ohio River plants equaled or exceeded various amounts. (Plot of data given in Table No. 54b)

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[37] These charts have been plotted from the data given in Table No. 54.

[38] In this connection, it should be noted that in general the flatter the slope of the "ogive" plot on "probability paper," the sharper is the corresponding crested frequency curve and the less variable are the individual items comprising the frequency distribution.

In Figures 39 and 40 are shown a series of illustrative plots of the *B. coli* data similar to those previously drawn from the plate-count distributions. The graphs in these charts display the same general characteristics as previously noted in connection with the preceding charts, except that the plots based on the raw-water data are somewhat less well defined, owing to the relatively wide plotting intervals

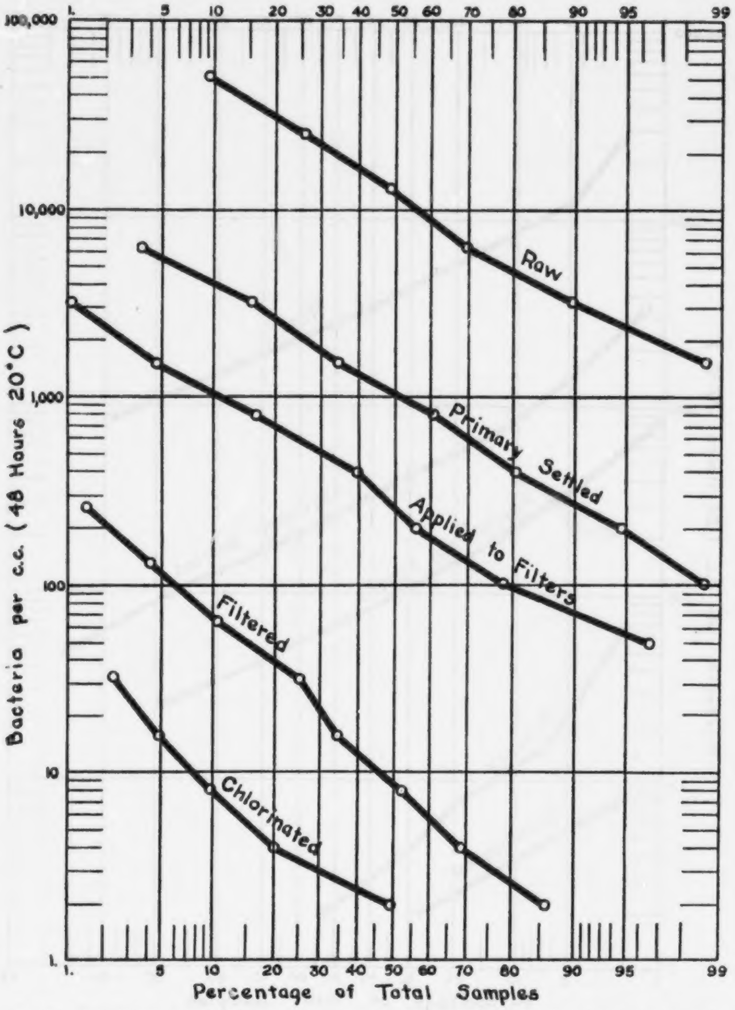

FIG. 38a.—Logarithmic probability plot showing the frequencies with which the bacterial content of the raw water and designated effluents at the Ironton plant equaled or exceeded various amounts (48-hour agar counts at 20° C.). (Plot of data given in Table No. 54a)

resulting from the use of the decimal system of dilutions in making the *B. coli* tests. The plots derived from the unchlorinated and chlorinated filter effluent data are restricted in their range owing to the narrow limits of variation provided by the conditions under which the *B. coli* tests of these effluents were made. In spite of these deficiencies, the graphs show in every major respect a striking similarity to the corresponding plots based on the plate counts.

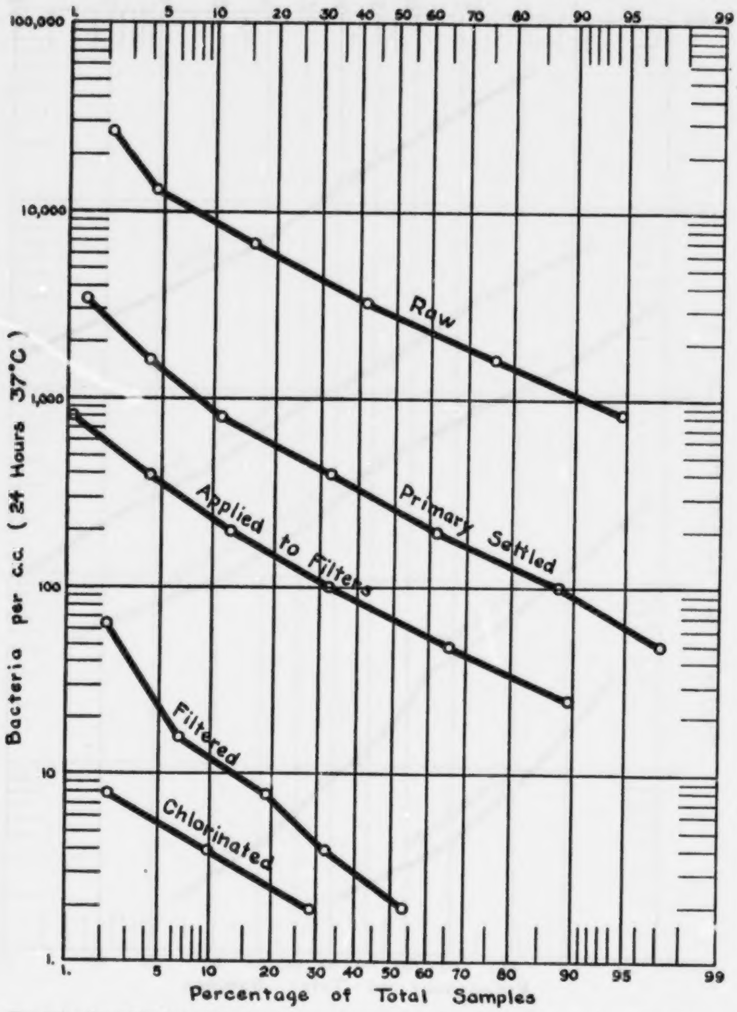

FIG. 38b.—Logarithmic probability plot showing the frequencies with which the bacterial content of the raw water and designated effluents at the Ironton plant equaled or exceeded various amounts (24-hour agar counts at 37° C.). (Plot of data given in Table No. 54b)

Aside from showing the actual variations observed in the bacterial quality of the several raw waters and effluents of the Ohio River plants, the foregoing data are significant chiefly in the possible indi-

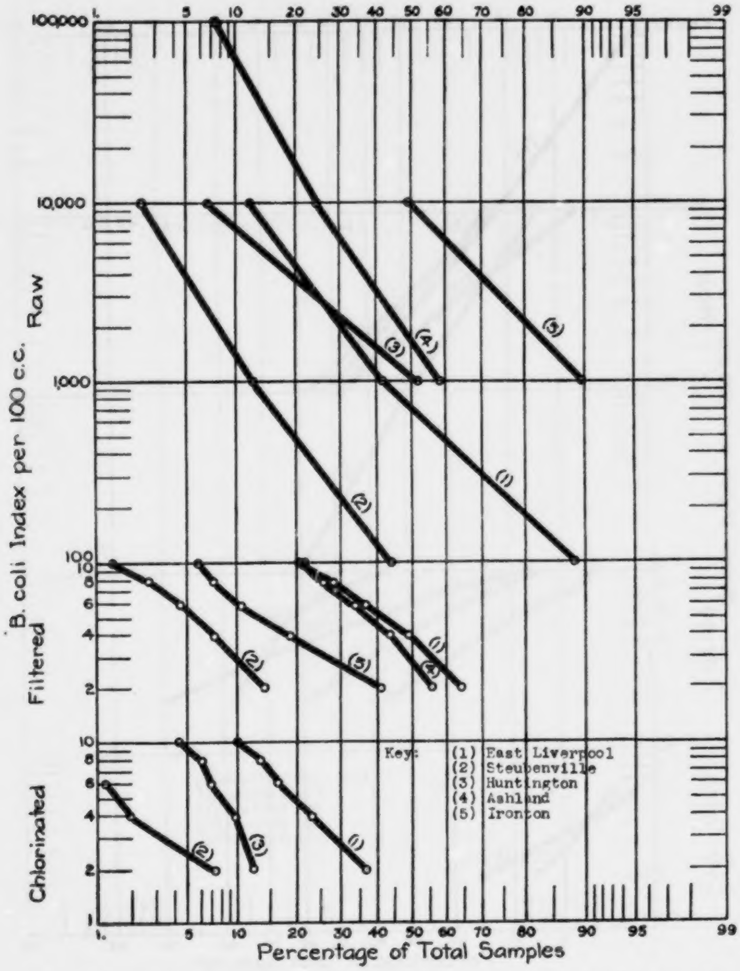

FIG. 39a.—Logarithmic probability plot showing the frequencies with which the *B. coli* index of the raw waters and the unchlorinated and chlorinated filter effluents of designated Ohio River plants equaled or exceeded various amounts. (Plot of data given in Table No. 54c)

cations which they may give concerning the frequencies with which the quality of these raw waters or effluents might be expected to show, under normal conditions, a deterioration below a given standard. This question is of importance not only as an element to be taken into account in determining a condition of normal variation as a basis for fixing a safe and reasonable working standard, but also in its bearing on the possibilities which might exist in a raw water or

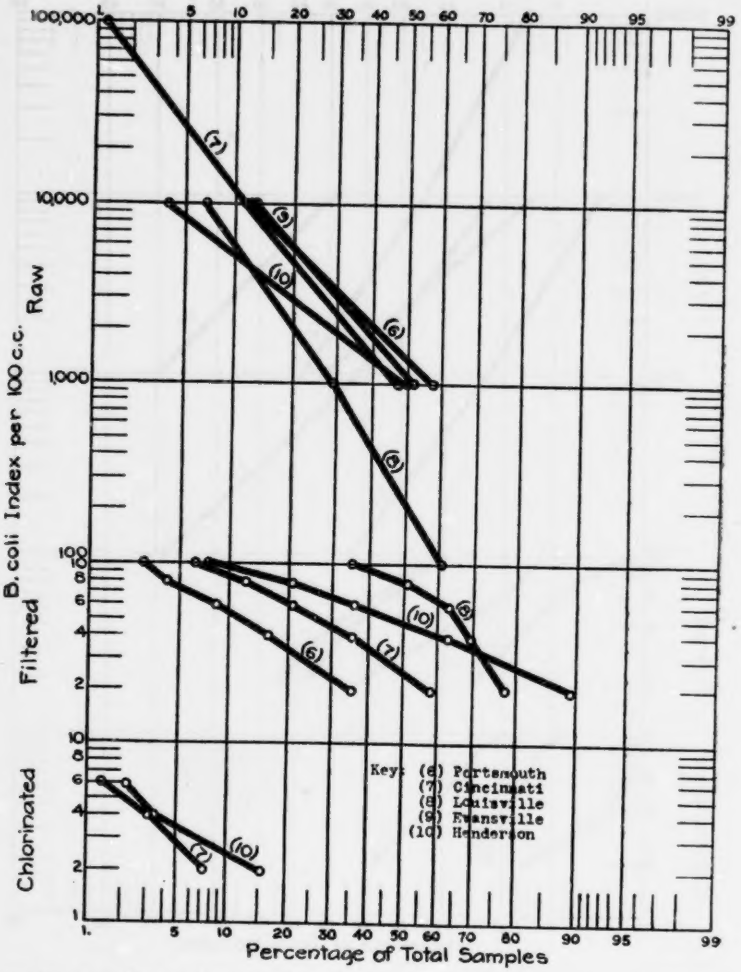

FIG. 39b.—Logarithmic probability plot showing the frequencies with which the *B. coli* index of the raw waters and the unchlorinated and chlorinated filter effluents of designated Ohio River plants equaled or exceeded various amounts. (Plot of data given in Table No. 54c)

effluent showing an average conformance to a given standard, for the occurrence of temporary lapses in the quality below the standard sufficiently frequent or prolonged to have consequences of epidemiological significance.

As regards the actually observed variations in the quality of the different raw waters, it is noted in Table No. 54 that in six of the ten raw waters, a *B. coli* index equal to or exceeding 10,000 per 100 cubic

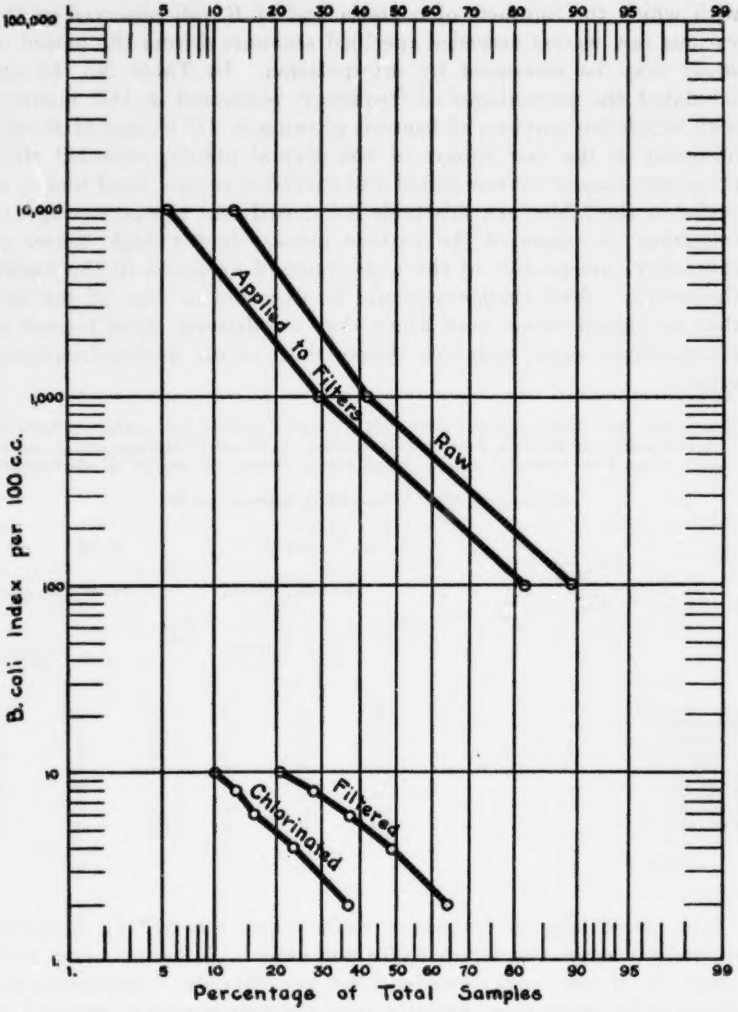

FIG. 40.—Logarithmic probability plot showing the frequencies with which the *B. coli* index of the raw water and designated effluents at the East Liverpool plant equaled or exceeded various amounts. (Plot of data given in Table No. 54c)

centimeters was observed in more than 10 per cent of the samples examined during the year of the observations. In only two instances, however, was a raw-water index equaling or exceeding 10,000 observed with a frequency greater than 20 per cent, and in both of these cases (i. e., Ashland and Ironton) the mean index for the year exceeded the same figure.

By referring to the plots shown in Figures 37 and 39 the frequencies with which the numbers of bacteria and of *B. coli* observed in the various raw waters exceeded specified amounts during the period of study may be estimated by interpolation. In Table No. 55 are tabulated the percentages of frequency, estimated in this manner, with which the numbers of bacteria growing at 37° C. and of *B. coli*, observed in the raw waters of the several plants, exceeded their respective means for the period and exceeded certain fixed limits, as stated in the table. In this table it is noted that the percentages of frequency in excess of the various means show a high degree of constancy, irrespective of the wide range of variation in the means themselves, which tendency would be expected in view of the fact that the distributions from which they are derived, when formed in a logarithmic scale, approach closely those of the normal-frequency type.

TABLE NO. 55.—*Estimated percentages of frequency with which numbers of bacteria in raw waters of 10 Ohio River plants equaled or exceeded their respective means and equaled or exceeded certain stated limits during the period of observations*

[Percentages derived from graphs in Figures 37 and 39]

Plant	Bacteria, 24 hours, 37° C.			B. coli		
	Mean count	Per cent frequency =or>		Mean index	Per cent frequency =or>	
		Mean	3,000 per c. c.		Mean	5,000 per 100 c. c.
East Liverpool	4, 420	30	42	2, 680	26	19
Steubenville	763	22	5	333	25	4
Huntington	1, 590	30	14	2, 370	30	16
Ashland	1, 040	30	3	11, 500	23	34
Ironton	4, 190	30	46	14, 900	40	64
Portsmouth	1, 350	30	10	3, 490	29	23
Cincinnati	997	26	6	2, 980	27	20
Louisville	1, 890	31	20	2, 220	19	12
Evansville	4, 980	30	49	3, 940	26	23
Henderson	5, 290	31	50	1, 740	33	11
Average		29			28	

The percentage of frequency with which the 37° C. bacterial counts exceeded the figure 3,000 per cubic centimeters, and with which the *B. coli* index exceeded 5,000 per 100 cubic centimeters, are shown to be much more variable than the percentages as referred to the respective means. In Figures 41 and 42, however, in which these data are plotted, it is shown that when these percentages are plotted against their corresponding means, the two variables bear a decided relation to each other, characterized by curves of similar form in both instances.

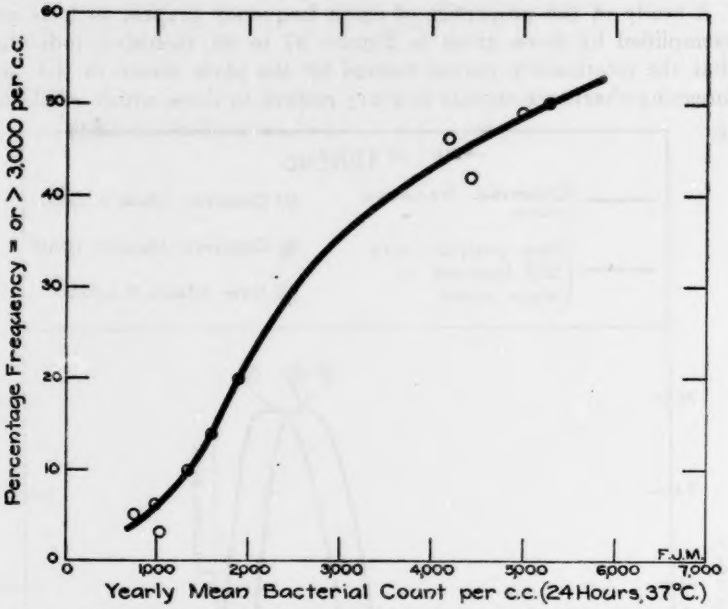

FIG. 41.—Relation between the yearly mean bacterial count, as observed in the raw waters of the 10 Ohio River plants during the period of observations, and the estimated frequencies with which the count equaled or exceeded 3,000 per cubic centimeter. (Plot of data given in Table No. 55)

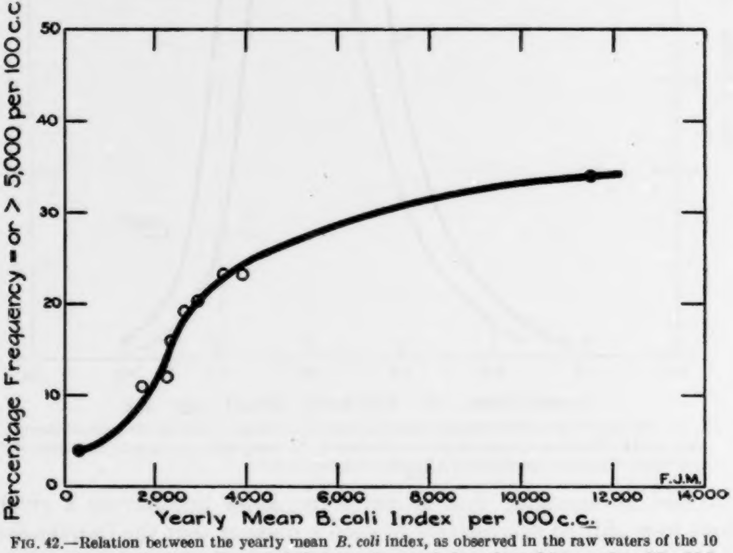

FIG. 42.—Relation between the yearly mean *B. coli* index, as observed in the raw waters of the 10 Ohio River plants during the period of observations, and the estimated frequencies with which the index equaled or exceeded 5,000 per 100 cubic centimeters. (Plot of data given in Table No. 55)

A study of the properties of ogive frequency graphs, such as are exemplified by those given in Figures 37 to 40, inclusive, indicates that the relationship curves formed by the plots shown in the two foregoing charts are similar in every respect to those which would be

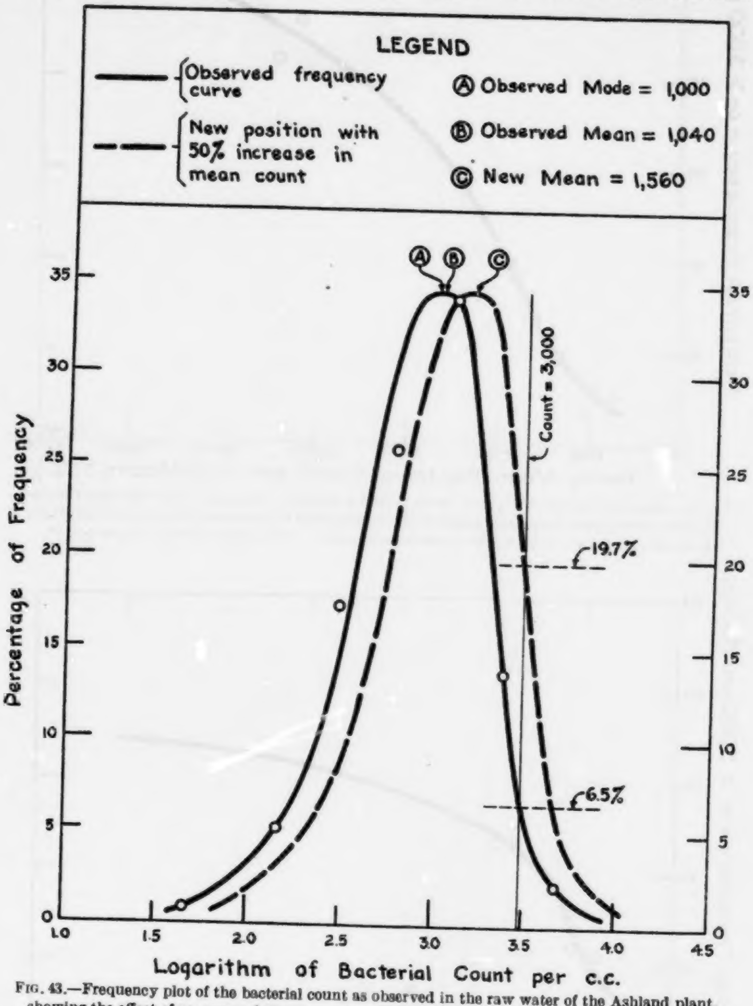

FIG. 43.—Frequency plot of the bacterial count as observed in the raw water of the Ashland plant, showing the effect of an assumed 50 per cent increase in the yearly mean count of the frequency of occurrence of counts approximating 3,000 per cubic centimeter

obtained by assuming that an ogive frequency line having a given slope were shifted successively in such a manner that the frequencies of bacterial counts in excess of given magnitudes became progressively increased. The corresponding effect produced on a crested frequency curve from which the ogive were derived would be produced by shifting its position horizontally in a manner such that its mode became progressively increased in magnitude. An illustration of such an effect is given in Figure 43, in which the crested frequency curve derived from the 37° C. count data for the Ashland plant (reproduced from fig. 36) is shown in its original position and shifted to a new location corresponding to an increase of 50 per cent in the mean count. In this instance it is noted that the frequency with which bacterial counts equal to 3,000 per cubic centimeter are obtained is increased from 6.5 per cent to 19.7 per cent, or slightly more than three-fold. On referring back to Figures 41 and 42, it is noted, however, that a disproportionately high increase in the frequency of occurrence of counts in excess of given magnitudes occurs only within certain ranges of these magnitudes, in which the curve is convex with reference to the lower horizontal axis of the coordinate system.

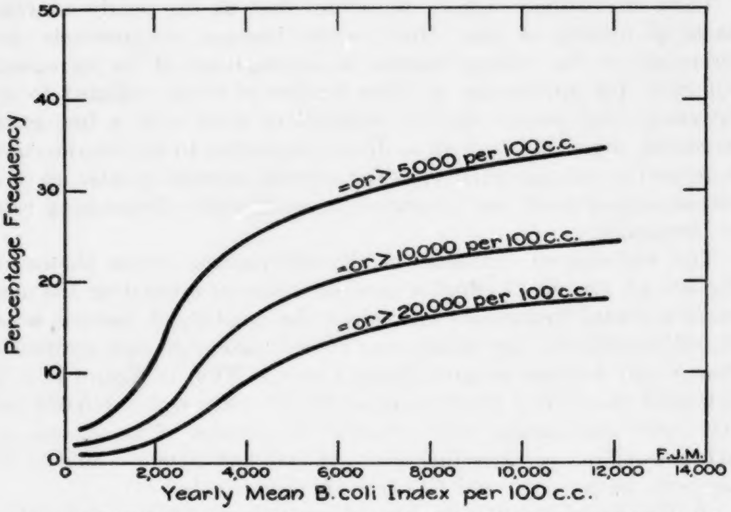

FIG. 44.—Relation between the yearly mean *B. coli* index, as observed in the raw waters of the 10 Ohio River plants, and the estimated frequencies with which the index equaled or exceeded designated limits. (Plot of data similar to those given in Table No. 55)

In Figure 44, which is an elaboration of Figure 43, made for the purpose of showing the relation existing between curves based on frequencies in excess of three different stated limits, it is apparent that the range of mean counts within which the curve is convex becomes extended very considerably with an increase in the limits to which the excess is referred. Expressed in other words, the higher the limiting count considered, the greater is the range of yearly mean counts within which a disproportionately rapid increase can occur in the frequency with which this limiting count may be exceeded. Under the conditions shown in Figure 44, which appear to represent fairly those attending increased average pollution of raw-water supplies taken from the Ohio River, a deterioration in the quality of these supplies below that which is indicated by a *B. coli* index of 5,000 per cubic centimeter would be expected to occur with disproportionately higher frequencies as the yearly average index became increased in amounts up to approximately 2,000 per 100 cubic centimeters; likewise a similarly rapid deterioration below a quality indicated by a *B. coli* index of 20,000 as the average index increased up to approximately 4,000 per 100 cubic centimeters. In each one of the two instances cited, the change in the inflection of the curve beyond the point stated indicates that the reverse would be expected to occur as the average became increased beyond this point.

These indications suggest, therefore, that as the yearly average bacterial quality of Ohio River water becomes progressively deteriorated at the various intakes in consequence of its increasing pollution, the appearance at these intakes of water polluted to an extremely high degree may be expected to occur with a frequency increasing more rapidly than in direct proportion to its deterioration in respect to average quality, as the average becomes greater up to a certain critical point, and thereafter to occur with a diminishing rate of frequency.

The well-defined character of the relationship curves shown in Figures 42, 43 and 44 afford a possible means of estimating the normally expected frequencies with which the numbers of bacteria or of *B. coli* in different raw waters may exceed various given magnitudes, their yearly average amounts being known. Thus in Figure 44 it is indicated that with a yearly average *B. coli* index equal to 5,000 per 100 cubic centimeters, the expected frequencies of occurrence of indices equaling or exceeding 5,000, 10,000, and 20,000, would be 27 per cent, 18 per cent, and 12 per cent, respectively.

In Figures 38 and 40 it has been shown that the frequency distributions formed by the variations occurring in the numbers of bacteria and *B. coli* observed in the different effluents from the Ohio River plants are similar, in their major characteristics, to those formed by corresponding variations in the bacterial and *B. coli* contents of the several raw waters. In view of this fact it would appear, therefore, that the correlations above described should be applicable, likewise, as a basis for estimating the frequencies with which the bacterial quality of given kinds of effluents would be expected, under normal conditions, to show various degrees of deterioration. In this connection it was of particular interest to inquire as to the indicated probable frequencies of deterioration of the unchlorinated and chlorinated filter effluents below specified limits, as measured in terms of the *B. coli* index.

The results of routine *B. coli* determinations made on samples of these effluents were not wholly satisfactory, however, for purposes of studying the kind of correlations above described, chiefly for the reason that they covered a comparatively narrow range of magnitudes in respect to *B. coli* density, namely, from zero to 10 per 100 cubic centimeters. Under the conditions imposed by the tests, moreover, the lowest individual positive *B. coli* index obtainable within this range was 2.0 per 100 cubic centimeters, which is double the upper limit fixed by the revised Treasury Department standard. The only procedure available, therefore, by which the percentages of frequency of *B. coli* indices equaling or exceeding the Treasury Department standard limit could be estimated from the ogive graphs given in Figures 39 and 40 would be that of extrapolating each plot to its point of intersection with the horizontal line corresponding to the Treasury Department standard.

By following this procedure, results were obtained as given in Table No. 56, in which are shown the respective yearly means and the corresponding estimated percentages of frequency with which the *B. coli* index equaled or exceeded 1.0 per 100 cubic centimeters, in so far as they are indicated by the plots given in Figures 39 and 40. In this table the estimated frequencies of *B. coli* indices equaling or exceeding the respective means have been omitted because of the relatively low values of the means for the chlorinated effluents (all of them being less than 1.0 per 100 c. c.) and the accordingly long distances over which it would be necessary to extrapolate the plots in order to secure an intersection with the mean line in each case.

TABLE No. 56.—*Estimated percentages of frequency with which the numbers of B. coli in the filter effluents of designated Ohio River plants equaled or exceeded 1.0 per 100 cubic centimeters during the period of observations*

(Derived from plots in Figure 39)

Plant	Unchlorinated filter effluent		Chlorinated filter effluent	
	Mean B. coli index per 100 c. c.	Estimated % = or > 1.0 per 100 c. c.	Mean B. coli index per 100 c. c.	Estimated % = or > 1.0 per 100 c. c.
East Liverpool	2.2	77	0.4	52
Steubenville	.6	25	.2	20
Huntington	--------	--------	.8	19
Ashland	3.5	74	--------	--------
Ironton	1.6	65	--------	--------
Portsmouth	1.7	60	--------	--------
Cincinnati	3.4	77	.4	14
Louisville	17.0	85	--------	--------
Henderson	4.7	98	.4	36

The trend of the data given in table No. 56 is illustrated graphically in Figure 45, in which the points plotted from the unchlorinated effluent figures are distinguished from those derived from the chlorinated effluent values by the use of two different symbols. In drawing the curve, due weight has been given to all of the points, though in this as well as in the preceding charts of the same nature, no precise least squares fitting of the curve has been attempted.

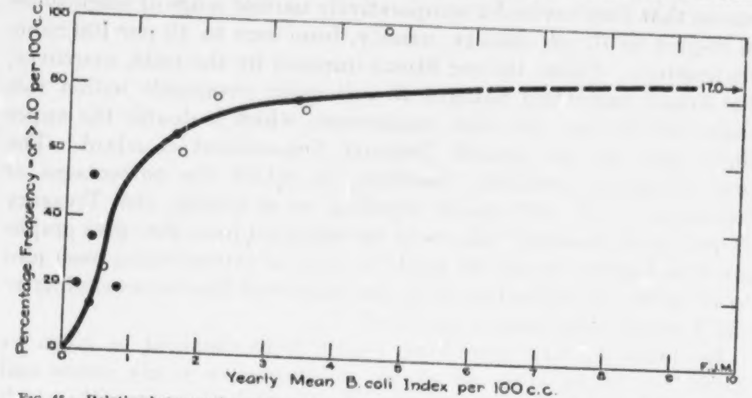

FIG. 45.—Relation between the yearly mean *B. coli* index, as observed in the effluents from the 10 Ohio River plants, and the estimated frequencies with which the index equaled or exceeded 1.0 per 100 cubic centimeters. (Plot of data given in Table No. 56)

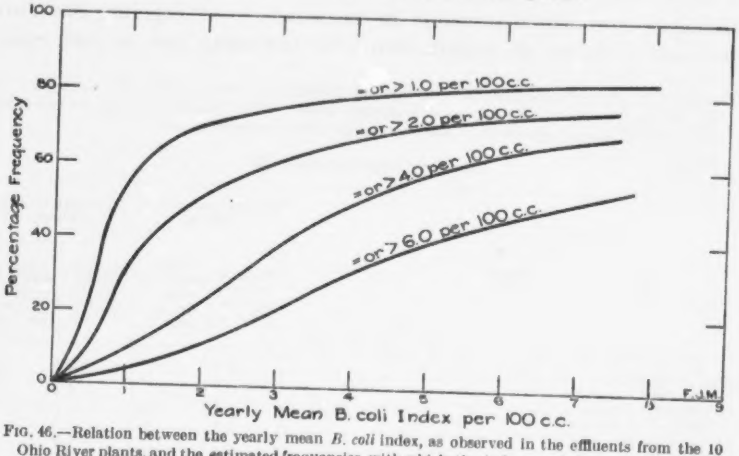

FIG. 46.—Relation between the yearly mean *B. coli* index, as observed in the effluents from the 10 Ohio River plants, and the estimated frequencies with which the index equaled or exceeded various designated limits (Plot of data similar to those given in Table No. 56)

In Figure 46, a series of curves, including the one given in the preceding chart, has been developed in order to show the relations existing between the mean *B. coli* index of the effluent and the estimated frequencies with which individual values of the index would be expected to equal or exceed various limits, ranging from 1.0 to 6.0 per 100 cubic centimeters. These curves are shown to be similar to those derived, as in Figure 44, from the corresponding raw-water data.

On referring to Figure 46, it will be noted that the ordinate of each curve at its point of intersection with a vertical line drawn from an abscissa corresponding to its equivalent mean tends to approximate 50 per cent. For example, the uppermost curve, referring to frequencies equal to or exceeding an index of 1.0 per 100 cubic centimeters, intersects the vertical line drawn upward from an abscissal value of 1.0 at an ordinate equal to 54 per cent, a round figure. Similarly, the next curve lower, referring to frequencies equaling or exceeding 2.0 per 100 cubic centimeters, has an ordinate equal to 51 per cent, corresponding to an abscissal value of 2.0; the next one, 50 per cent, with an abscissa of 4.0, and the lowermost curve, 51 per cent, with an abscissa of 6.0. The relative uniformity of these percentages indicates that they have the same tendency toward constancy as is displayed by the corresponding raw-water figures given in table No. 39.

In Figure 46 it is of interest to compare the percentages with which an effluent having a mean *B. coli* index exactly equal to the limit fixed by the revised Treasury Department standard (i. e., 1.0 per 100 cubic centimeters) would be expected to show individual values of the index equal to or in excess of 1.0, 2.0, 4.0, and 6.0 per 100 cubic centimeters, respectively. These percentages are shown to be, in round numbers, 54 per cent, 32 per cent, 10 per cent, and 4 per cent, respectively, as read from the chart. On the basis of these figures, an effluent having a yearly average *B. coli* index exactly equal to the limit prescribed by the Treasury Department standard would be expected to show a *B. coli* index equaling or exceeding this limit for about half of the year, twice the limit for one-third of the year and four times the limit for one-tenth of the year.

A check as to the general rationality of these percentages is afforded by a series of corresponding figures derived by Reed[39] from an analysis of the probable variations in the indicated numbers of *B. coli*, as determined by individual tests of 10 cubic centimeter portions of the sample, from a mean value exactly equivalent to the limit fixed by the Treasury Department standard, the variation in question being assumed to be governed by the laws of probability involved in simple random sampling. In the following tabulation, the percentages derived by Reed[40] are given for comparison with the corresponding ones above stated:

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[39] Reed, Lowell J., Appendix II, Report of Committee on Drinking Water Standards, U. S. Treasury Department. Reprint No. 1029 from Public Health Reports, Apr. 10, 1925, pp. 16-17.

Number of (+) portions in sample (5 portions)	Equivalent *B. coli* index per 100 c. c.	Percentage of frequency of samples having index equal to or exceeding specified number	
		Reed's table[1]	Derived from Figure 46
1	2.0	41	32
2	4.0	8	10
3	6.0	1	4

[1] Per cents carried to nearest whole number for more ready comparison with those derived from Fig. 46.

Owing to the lack of a corresponding figure in Reed's table, no direct comparison of the percentages of frequency of indices equal to or exceeding 1.0 per 100 cubic centimeters is possible in the tabulation above given. By expanding the binomial expression $(0.9+0.1)^{10}$ in a manner similar to that described by Reed, an approximate comparison can be made of the result as thus obtained, with the figure, 54 per cent, derived from Figure 46. The result is found in the first term of the expanded binomial, which is: $(0.9)^{10}=34.7$ per cent, approximately. This figure represents, however, the frequency of occurrence of samples having an index less than 1.0 per 100 cubic centimeters; hence, the frequency of indices equal to or greater than the amount stated is: 100 per cent $-$ 34.7 per cent $=$ 65.3 per cent. Making due allowance for the fact that the percentages derived from Figure 46 are wholly empirical and are subject to a complexity of possible errors, the concordance between these percentages and the corresponding ones derived from Reed's analysis of the problem from a theoretical standpoint is so close as to indicate that these empirical values are fairly reasonable, at least, in their general order of magnitude.

The question as to what effects progressive changes in the average bacterial quality of the several raw waters might be expected to have on the frequencies with which the quality of the various effluents may become deteriorated below given limits, may be solved readily in specific instances by determining the corresponding expected change in the average quality of the effluent (using a correlation curve such as is shown in fig. 30) and, on this basis, estimating the change in the frequency with which the quality of the effluent might be expected to be deteriorated below the given limit (using a curve such as in fig. 46).

As an example of such a determination, let it be assumed that a given raw water has a yearly mean *B. coli* index equal to 2,500 per 100 cubic centimeters and let it be required to estimate what effect a twofold increase in this average (i. e., to 5,000 per 100 cubic centimeters) would have on the frequency with which the *B. coli* index of the chlorinated filter effluent exceeded the limit fixed by the Treasury Department standard (i. e., 1 per 100 cubic centimeters). On referring to Figure 30, the change in the *B. coli* index of the chlorinated effluent, corresponding to an increase in the raw water index from 2,500 to 5,000, is indicated as being from 0.8 to 1 per 100 cubic centimeters. Referring next to Figure 45, the change in the frequency with which an index equal to 1 would be exceeded, with an increase in the mean index from 0.8 to 1, would be from 48 per cent to 54 per cent, or a net change equal to 12 per cent. It thus is indicated that a twofold increase in the raw water *B. coli* index would result in an increase of but 12 per cent in the frequency with which the *B. coli* index of the chlorinated effluent exceeded the Treasury Department standard limit. In general, the percentage of increase would vary however, with the particular portion of the curve (fig. 45) over which the change in the mean index were measured.

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[40] Loc. cit., p. 68

Summary of Part II.

The results of the studies which have been presented in the foregoing section of this report may be summarized briefly under the following headings:

(a) The present status of bacterial pollution of the Ohio River in the various zones from which raw water supplies are taken for purification.

(b) The quality of effluents produced by the several Ohio River plants under varying conditions of raw water pollution.

(c) The efficiency of purification shown by the plants of the two general types (i. e., Groups I and II) represented.

(d) The limiting bacterial content of the river water which is safely consistent with the production of effluents of specified bacterial quality.

(e) The influence which seasonal and certain other conditions, notably raw water turbidity, which are not subject to control by the plant operator, have on the efficiency of bacterial removal which may be expected from plants treating Ohio River water.

(f) The frequencies with which the numbers of bacteria observed in the several raw and treated waters exceeded specified limits and the extent to which these frequencies were found to be related to different factors, notably to the respective stages of treatment from which the waters were derived and to variations in their yearly average bacterial content.

As regards the present status of bacterial pollution of the river in zones from which raw water supplies are taken, these studies have indicated that the zone in which the maximum pollution occurs is in the vicinity of Ashland and Ironton, where the average *B. coli* index of the raw water exceeded 10,000 per 100 cubic centimeters during the period of observation. At all other points observed, the average index was found to be less than 5,000 *B. coli* per 100 cubic centimeters.

The average quality of the chlorinated effluents produced by the Ohio River plants at the time of these observations was in every instance in conformance with the present Treasury Department *B. coli* standard. But one plant, however, was able to produce an unchlorinated filter effluent having an average *B. coli* index conforming to this standard. The conclusion is evident, therefore, that under present conditions of pollution of the river, purification plants of both types, as represented by Groups I and II, are indicated as being able with the constant and effective use of chlorine disinfection to produce final effluents meeting the Treasury Department standard, but without the aid of this measure they undoubtedly would be unable to do so, and in a majority of cases would fail by a considerable margin.

The efficiency of bacterial purification shown by the various Ohio River plants during the period of the survey may be assumed as fairly representing the best which is attainable by them under normal conditions of current operating practice. This was true for the reason that each one of the plants observed was under the direction of a competent trained supervisor, assisted by a capable operating personnel, and the exercise of laboratory control was in conformance with the highest standards usually maintained by water purification plants in this country. Under these circumstances it is fair to assume that, under the conditions which have been described, no greater efficiencies of bacterial removal might be expected from the several plants under the conditions now prevailing than those which were observed in connection with this survey.

The results of the survey have shown clearly the advantage in respect to bacterial efficiency possessed by the plants of the type designated as Group I, using two separate stages of preliminary sedimentation, as compared with those of Group II, using but a single stage of sedimentation. Although data were available from only two plants of Group I (i. e., Ironton and Portsmouth), using continuous coagulation at both stages of sedimentation, the results obtained from these plants would appear to show definitely that the addition of a coagulant at both stages of sedimentation causes a decided increase in the over-all efficiency of bacterial removal.

The results secured from the correlations between the quality of the various raw waters and that of the effluents, which have been fully described, have indicated that, considering the 10 Ohio River plants as a single group irrespective of type, the maximum limit of *B. coli* in the raw water consistent with the production of final chlorinated effluents conforming to the Treasury Department standard approximates 5,000 per 100 cubic centimeters, and that the limit consistent with producing unchlorinated effluents meeting the same standard is roughly 60 *B. coli* per 100 cubic centimeters, basing this figure on the performance of three of the plants showing a higher order of efficiency in this respect than the remaining plants of the group from which observations were available.

On the basis of limiting figures above stated, but 2 of the 10 plants under observation (that is, at Ashland and Ironton) would be considered as being overburdened in so far as the production of satisfactory chlorinated effluents is concerned. As regards the production of unchlorinated effluents satisfying the Treasury Department *B. coli* standard, all of the 10 plants would be considered as being very decidedly overburdened.

In general the data from the survey indicate that the effects of variations in season and in raw water turbidity have little or no influence on the over-all efficiency of removal of *B. coli* by the various plants. Both of these factors, however, are shown to affect the indicated efficiencies of removal of the bacteria which are included in the 20° C. and 37° C. plate counts.

Finally, as regards the frequencies with which the numbers of bacteria observed in the raw and treated waters exceeded specified limits of magnitude, these frequencies have been found to follow distribution curves of the "skew" type, approaching closely the "normal" curve, however, when the limiting numbers of bacteria to which the respective frequencies are referred are plotted on a logarithmic abscissa scale. The slopes of the cumulative or "ogive" plots of these frequency distributions, when plotted on logarithmic scales, as stated, were shown to have a decided tendency toward mutual uniformity, irrespective of the location of the source of the raw water in the river or of the stage of its treatment in the plant. This uniformity would indicate that the constants of the frequency distributions defining the variations of the bacterial counts from their respective modal values tend to be approximately the same for the several raw waters and effluents considered.

A further analysis of the frequency distributions thus established has shown empirically that the frequencies with which the bacterial content of the several raw and treated waters, exceed specified numbers is definitely related to the average numbers over periods of a year or thereabouts, but that the frequency with which the bacterial content exceeds its own mean, over similar periods, tends, within certain limits, to remain fairly constant irrespective of the magnitude of the mean. From these considerations a basis appears to have been established for predicting, with a reasonably high degree of accuracy, the frequencies with which the bacterial content of a given raw water, or effluent, its yearly average being known or assumed, may be expected to exceed any specified limit; likewise for estimating the effect which a progressive increase in the yearly mean may be expected to have on the frequency of occurrence of bacterial numbers exceeding such a limit. All of these indications are basic, in that they have been designed to lay the groundwork for further study of the complex question of permissible variations in the bacterial quality of raw waters and of effluents, in relation to prescribed limiting values of mean quality.

PART III

INTRODUCTORY

In the preceding section of this report the results obtained from the portion of the 1923–24 survey concerned with 10 municipal filtration plants located directly on the Ohio River have been discussed. The present section deals with the results obtained from the part of the survey having reference to a group of seven plants located at various points elsewhere than on the Ohio River.

As noted in the introductory text (see p. xx) the list of plants selected for study at points other than on the Ohio River was governed by a somewhat different consideration than in the case of the Ohio River plants. In the latter instance it was desired to study the Ohio River plants as a more or less compact group, whereas in the case at hand the object in view was that of securing observations from isolated plants, representing as wide a variety of typical examples involving the treatment of water from highly polluted sources, as were obtainable with the limited funds available. It was desired, moreover, that these plants should be located in the more populous areas of the Eastern and Middle Western States, where stream pollution problems are assuming more serious proportions than in other sections of the country. For obvious reasons, therefore, it is necessary in the present section of the report to treat each plant studied from a more individual viewpoint than is true of those discussed in Part II.

The plants selected for study were located at the following points:

(a) Albany, N. Y.
(b) Chester, Pa.
(c) Elmira, N. Y.
(d) New Milford, N. J.
(e) Niagara Falls, N. Y.
(f) Toledo, Ohio.
(g) Youngstown, Ohio.

Of these plants, all except two, namely, those at Chester and New Milford, are municipally owned. The plant at Chester is owned and operated by the New Chester Water Co. and at New Milford by the Hackensack Water Co., the latter plant serving the city of Hackensack. Each one of the plants thus selected presents a typical and more or less distinct problem. Considering them in alphabetical order, as above listed, the following remarks may be set down in reference to the kind of problem represented in each instance:

(a) *Albany.*—The raw water supply is taken from the Hudson River below the sewers of a densely populated district including

Troy, immediately upstream, and numerous cities along the Mohawk River, a branch of the Hudson entering a short distance above Albany. The density of pollution of the river at the Albany intake is exceedingly high, both bacterially and organically, the pollution being largely of domestic sewage origin. The plant represents a modified slow sand filter installation, elaborated, since the high pollution of the raw water supply became evident, by the addition of coagulation and rapid sand filtration as steps in the preliminary treatment of the water prior to its delivery to its slow sand filters.

(b) *Chester.*—The raw water supply of this plant is taken from the Delaware River at a point located approximately 15 miles below Philadelphia. The average density of pollution of the river at this point is extremely high, being about the same as at Albany, and is complicated by the presence of large amounts of industrial wastes, including at the time of the survey certain wastes originating in the oil-refining industries. The Chester plant is a typical rapid sand filter installation, but certain modifications in the treatment, notably preliminary aeration of the water, have been made necessary by the conditions of raw water pollution above described.

(c) *Elmira.*—The raw water supply is derived from the Chemung River, a highly polluted small stream receiving the sewage of a number of cities located at distances of 20 miles or more upstream. Before being delivered to the plant, however, the water taken from this stream is impounded during periods of excessive pollution of the river. The preliminary storage of the water during intermittent periods presents an interesting example of the possibilities existing for reducing the bacterial load on purification plants at critical times, where adequate preliminary storage facilities are available.

(d) *New Milford.*—The raw water supply of this plant is derived from the Hackensack River, a highly polluted source, but it is stored continuously prior to delivery to the plant for treatment. A study of the efficacy of the continuous preliminary storage of a highly polluted water in connection with its filtration was therefore possible in this instance. The New Milford plant is a typical rapid sand filter installation, somewhat modified and enlarged since the time of its original construction.

(e) *Niagara Falls.*—The raw water supply of the Niagara Falls plant is taken from the Niagara River, which carries the overflow water from the Great Lakes. The river is polluted above the Niagara Falls intake by sewage from several important near-by cities, including Buffalo and North Tonawanda. An opportunity was thus provided for observing the efficiency of purification of Great Lakes water under conditions of relatively high bacterial pollution.

(f) *Toledo.*—The raw water supply of this plant is taken from the Maumee River, which drains a densely populated area above Toledo and empties into Lake Erie. The problem in this case was one involving the possibility of two alternative sources of raw water supply, one a highly polluted stream and the other one of the Great Lakes. At the time of the survey, Toledo was facing the possibility of being forced by excessive pollution of the Maumee River supply to abandon it in favor of a source located in Lake Erie.

(g) *Youngstown.*—The raw water supply of the Youngstown plant originates in the Mahoning River, a stream densely polluted both by sewage and by industrial wastes principally from the steel and allied industries located in the district above Youngstown. The situation at Youngstown fairly represents the ultimate water supply conditions which may result from the extremely intensive industrialization of small areas, necessitating softening as well as purifying the water bacterially for domestic consumption.

Descriptive data concerning each plant are given in Appendix C of this report. It is sufficient to note at this point that practically every feature of water purification practice in the United States for the specific purpose of bacterial removal was here represented, and the opportunity was available for observing the efficiency of the various processes under conditions approaching those which are or ultimately must be faced by numerous other communities similarly situated.

The methods used in collecting and analyzing the data from these plants were similar in every respect to those which were followed in the survey of the Ohio River plants, as described in Part II of this report. In the discussion of the data which follows, the order and manner of presentation will follow approximately the same lines as in Part II.

Presentation of Base Data.

Base tables containing the results of daily laboratory examinations at the several plants are given in Appendix B of this report, the scope and arrangement of the tables being uniform with that of similar tables for the Ohio River plants as given in Appendix A. Summaries of operation and laboratory data expressed in terms of monthly averages are given in Table No. 57. In Tables Nos. 58 and 60A are summarized, respectively, averages for each plant covering the year of observations, and corresponding percentages of residual turbidity and bacterial. In Table No. 59 averages are given covering two seasonal periods of six months each, namely, May to October and November to April, both inclusive, which periods represent, respectively, the warmer and colder halves of the year. Additional tables of a special nature will be presented in connection with the discussion of the data which follows.

Table No. 57.—*Summary of monthly average operation data and laboratory results reported from each individual plant*

ALBANY (N. Y.) FILTRATION PLANT

Month	Operation data														
	Average daily volume of water treated	Filter operation				Coagulants (grains per gallon)									Chlorine	Average river stage
		Average length of run	Washing			Alum			Iron sulphate			Lime or soda				
			Wash water	Average time	Rate (inches per minute)	Aver-age	Maxi-mum	Mini-mum	Aver-age	Maxi-mum	Mini-mum	Aver-age	Maxi-mum	Mini-mum		
1923	*1,000 gallons*	*Hours*	*Per cent*	*Minutes*											*P. p. m.*	*Feet*
October	21,900	22.7	----------	6.0	1.8	4.1	4.8	3.3	----------	----------	----------	----------	----------	----------	0.61	98.3
November	19,800	22.4	----------	6.0	1.5	3.5	4.6	2.4	----------	----------	----------	----------	----------	----------	.71	99.0
December	17,400	22.1	----------	4.5	2.0	2.4	3.5	1.7	----------	----------	----------	----------	----------	----------	.16	101.1
1924																
January	18,200	21.0	----------	4.5	2.0	2.3	3.2	1.6	----------	----------	----------	----------	----------	----------	.12	100.7
February	19,900	20.0	----------	4.5	2.0	2.0	2.5	1.6	----------	----------	----------	----------	----------	----------	.19	99.6
March	21,200	22.9	----------	5.0	1.4	2.1	2.5	1.5	----------	----------	----------	----------	----------	----------	.20	100.4
April	19,800	22.7	----------	5.0	1.4	2.9	1.7	2.1	----------	----------	----------	----------	----------	----------	.17	105.0
May	20,500	13.1	----------	4.0	1.4	1.8	1.8	1.8	----------	----------	----------	----------	----------	----------	.33	104.1
June	20,200	14.3	----------	3.5	1.5	2.7	4.2	2.0	----------	----------	----------	----------	----------	----------	.56	99.2
July	21,400	16.0	----------	3.0	1.8	4.5	5.5	4.2	----------	----------	----------	----------	----------	----------	.62	99.3
August	21,300	18.0	----------	3.8	1.6	5.2	6.0	4.5	----------	----------	----------	----------	----------	----------	.57	99.9
September	22,300	18.0	----------	3.5	1.7	4.6	5.6	3.5	----------	----------	----------	----------	----------	----------	.50	99.5
Average	20,300	19.4	----------	4.4	1.7	3.2	3.8	2.5	----------	----------	----------	----------	----------	----------	.40	100.5
Maximum	22,300	22.9	----------	6.0	2.0	5.2	6.0	4.5	----------	----------	----------	----------	----------	----------	.71	105.0
Minimum	17,400	13.1	----------	3.0	1.4	1.8	1.7	1.5	----------	----------	----------	----------	----------	----------	.12	98.3

Month	Laboratory data																				
	Water temperature	Turbidity			Alkalinity		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
		Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
1923	° *C.*																				
October	14.0	4.4	------	0.9	51	30	19,900	------	2,950	570	6.9	3,950	------	355	140.0	5.8	70,000	------	832	9.0	0.41
November	3.6	3.9	------	2.2	42	24	2,870	------	850	20	6.4	1,180	------	170	12.0	6.1	15,400	------	940	4.3	.43
December	4.8	12.0	------	4.2	33	22	15,900	------	1,380	16	4.4	1,160	------	304	8.9	3.4	17,900	------	942	.32	.0
1924																					
January	2.6	16.0	------	6.6	37	24	9,900	------	2,200	160	6.5	950	------	190	12.0	4.8	53,500	------	594	.0	.0
February	------	4.9	------	3.2	48	36	7,750	------	2,875	840	33.0	1,280	------	340	160.0	6.5	10,300	------	659	.69	.25
March	2.8	16.0	------	3.8	54	39	31,000	------	5,900	425	20.0	1,500	------	260	14.0	6.1	9,710	------	593	1.6	.05
April	3.0	60.0	------	5.6	37	24	28,500	------	3,500	80	21.0	1,100	------	140	9.2	4.5	5,650	------	232	1.7	.09
May	6.2	21.0	------	4.0	34	21	17,600	------	17,800	37	5.8	450	------	250	3.0	2.1	4,750	------	536	1.3	.67
June	------	6.5	------	2.8	51	34	13,600	------	9,970	38	10.6	1,490	------	1,020	41.1	4.6	11,800	------	2,350	4.7	.15
July	21.4	6.0	------	3.0	60	31	16,800	------	3,980	77	21.0	3,300	------	1,450	48.0	9.0	12,300	------	1,000	.94	.07
August	20.0	3.0	------	1.9	64	30	37,700	------	3,050	53	10.0	8,500	------	2,100	21.0	3.0	5,030	------	1,030	.32	.25
September	19.0	3.0	------	1.0	49	26	14,500	------	2,860	22	5.5	5,710	------	3,180	10.0	5.5	16,300	------	658	1.3	.15
Average	9.7	13.0	------	3.3	47	28	18,000	------	4,780	195	13.0	2,550	------	813	40.0	5.1	19,400	------	864	2.2	.21
Maximum	21.4	60.0	------	6.6	64	39	37,700	------	17,800	840	33.0	8,500	------	3,180	160.0	9.0	70,000	------	2,350	9.0	.67
Minimum	2.6	3.0	------	.9	33	21	2,870	------	850	16	4.4	450	------	140	3.0	2.1	5,030	------	232	.9	.0

TABLE No. 57.—*Summary of monthly average operation data and laboratory results reported from each individual plant*—Continued

CHESTER (PA.) FILTRATION PLANT

Month	Operation data														
	Average daily volume of water treated	Filter operation				Coagulants (grains per gallon)									Chlorine	Average river stage
		Average length of run	Washing			Alum			Iron sulphate			Lime or soda				
			Wash water	Average time	Rate (inches per minute)	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum		
1923	*1,000 gallons*	*Hours*	*Per cent*	*Minutes*											*P. p. m.*	*Feet*
October	5,680	21.0	3.6	5.0	23.0	1.4	1.7	0.9	--------	--------	--------	--------	--------	--------	1.20	--------
November	5,850	23.0	3.2	5.0	21.0	1.1	1.4	.8	--------	--------	--------	--------	--------	--------	1.20	--------
December	5,880	25.0	2.9	5.0	24.0	1.1	1.5	.9	--------	--------	--------	--------	--------	--------	.90	--------
1924																
January	5,790	25.0	2.9	5.0	24.0	1.5	2.2	.9	--------	--------	--------	--------	--------	--------	.90	--------
February	5,560	27.0	3.1	5.0	24.0	1.4	2.2	1.0	--------	--------	--------	--------	--------	--------	.90	--------
March	5,010	23.0	3.1	5.0	24.0	1.3	1.5	.9	--------	--------	--------	--------	--------	--------	.70	--------
April	4,870	24.0	3.1	5.0	24.0	1.4	1.5	1.2	--------	--------	--------	--------	--------	--------	.60	--------
May	4,670	23.0	3.4	5.0	24.0	1.4	2.2	1.1	--------	--------	--------	--------	--------	--------	.60	--------
June	4,730	24.0	3.1	5.0	24.0	1.3	1.5	1.1	--------	--------	--------	--------	--------	--------	.70	--------
July	5,760	24.0	2.9	5.0	24.0	1.4	1.7	1.0	--------	--------	--------	--------	--------	--------	.70	--------
August	5,320	23.0	3.2	5.0	24.0	1.4	1.7	.9	--------	--------	--------	--------	--------	--------	.70	--------
September	5,020	24.0	3.0	5.0	24.0	1.5	1.9	1.2	--------	--------	--------	--------	--------	--------	1.00	--------
Average	5,350	24.0	3.1	5.0	24.0	1.3	1.8	1.0	--------	--------	--------	--------	--------	--------	.90	--------
Maximum	5,880	27.0	3.6	5.0	24.0	1.8	2.2	1.2	--------	--------	--------	--------	--------	--------	1.20	--------
Minimum	4,670	21.0	2.9	5.0	21.0	1.1	1.4	.8	--------	--------	--------	--------	--------	--------	.60	--------

Month	Laboratory data																		
	Water temperature	Turbidity			Alkalinity		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
		Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
1923	° C.																				
October		69.0		10.0	62	45						10,000		1,280	272.0	1.0	22,400		805	5.4	0.0
November		77.0		8.0	46	38						9,700		436	25.0	1.0	26,800		434	2.3	.8
December		81.0		7.0	29	22						3,900		332	7.0	1.0	17,100		309	2.4	.0
1924																					
January		160.0		23.0	22	12						4,300		270	8.9	2.5	23,500		392	2.8	.0
February		100.0		23.0	28	15						2,570		198	4.6	2.3	14,400		337	1.5	.0
March		95.0		15.0	32	22						2,570		176	3.3	1.3	17,900		368	4.3	.0
April		96.0		10.0	28	14						4,200		95	3.7	.6	14,200		269	3.0	.0
May		52.0		7.4	26	18						10,000		450	7.1	.9	22,200		824	4.1	.0
June		37.0		4.0	37	26						4,300		450	18.0	.6	14,300		639	7.0	.0
July		50.0		3.0	43	33						6,000		850	750.0	2.0	19,700		722	9.0	.0
August		44.0		3.0	46	35						6,500		485	245.0	4.0	26,000		800	10.0	.7
September		59.0		2.0	50	42						3,900		1,400	160.0	1.3	27,600		963	10.0	.0
Average		77.0		9.6	37	27						5,660		535	125.0	1.5	20,500		572	5.1	.0
Maximum		160.0		23.0	62	45						10,000		1,400	750.0	4.0	27,600		963	10.0	.8
Minimum		37.0		2.0	22	12						2,570		95	3.3	.55	14,200		269	1.5	.0

TABLE No. 57.—*Summary of monthly average operation data and laboratory results reported from each individual plant*—Continued

ELMIRA (N. Y.) FILTRATION PLANT

Month	Operation data															
	Average volume daily of water treated		Filter operation				Coagulants (grains per gallon)								Chlorine	Average river stage
			Average length of run	Washing			Alum			Iron sulphate			Lime or soda				
	River	Reservoir		Wash water	Average time	Rate (inches per minute)	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum		
1923	*1,000 gallons*		*Hours*	*Per cent*	*Minutes*											*P. p. m.*	*Feet*
November	5, 506	6, 040	9	....	197	....	0. 8	1. 0	0. 7	....	....	....	....	....	....	0. 7	....
December	3, 891	4, 553	103	....	187	....	. 8	1. 3	. 5	....	....	....	....	....	....	. 6	....
1924																	
January	4, 290	3, 321	....	....	226	....	1. 2	2. 0	. 7	....	....	....	....	....	....	. 6	....
February	4, 839	2, 233	....	....	195	....	. 8	1. 5	. 6	....	....	....	....	....	....	. 6	....
March	4, 426	2, 826	....	....	234	....	1. 0	2. 0	. 7	....	....	....	....	....	....	. 6	....
April	....	5, 221	....	....	267	....	1. 2	2. 0	. 8	....	....	....	....	....	....	. 6	....
May	4, 080	4, 378	....	....	200	....	. 8	1. 0	. 6	....	....	....	....	....	....	. 5	....
June	4, 745	2, 745	....	....	225	....	. 8	1. 2	. 6	....	....	....	....	....	....	1. 0	....
July	5, 045	3, 518	....	....	209	....	1. 2	1. 5	. 8	....	....	....	....	....	....	1. 6	....
August	5, 292	345	....	....	232	....	1. 1	2. 7	. 6	....	....	....	....	....	....	1. 7	....
September	5, 130	3, 800	....	....	197	....	. 8	1. 3	. 7	....	....	....	....	....	....	1. 4	....
October	5, 330	4, 880	....	....	197	....	. 8	1. 1	. 6	....	....	....	....	....	....	1. 3	....
Average	8, 200		....	....	214	....	1. 0	1. 6	. 7	....	....	....	....	....	....	. 9	....
Maximum	5, 506	6, 040	....	....	267	....	1. 2	2. 0	. 8	....	....	....	....	....	....	1. 7	....
Minimum	3, 891	2, 233	....	....	187	....	. 8	1. 0	. 5	....	....	....	....	....	....	. 5	....

Month	Laboratory data																				
	Water temperature	Turbidity			Alkalinity		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 cubic c. c.				
		Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
1923	° C.																				
November	10.0	12	------	0	98	81	5,080	------	------	4.2	7.3	------	------	------	------	------	551	------	------	0.0	0
December	5.0	24	------	0	46	39	8,950	------	------	9.8	13.0	------	------	------	------	------	581	------	------	0	.13
1924																					
January	2.9	87	------	0	40	32	23,800	------	------	7.9	------	------	------	------	------	------	674	------	------	.69	.28
February	2.3	32	------	0	64	58	14,500	------	------	6.7	11.0	------	------	------	------	------	555	------	------	0	0
March	3.8	114	------	0	34	27	26,600	------	------	13.0	11.0	------	------	------	------	------	430	------	------	0	0
April	6.7	183	------	0	21	14	5,300	------	------	7.1	8.8	------	------	------	------	------	166	------	------	.07	.07
May	12.0	50	------	0	35	28	6,380	------	------	7.3	11.0	------	------	------	------	------	479	------	------	0	0
June	19.0	29	------	0	64	60	5,990	------	------	6.0	19.0	------	------	------	------	------	817	------	------	.4	.53
July	22.0	31	------	0	69	60	6,330	------	------	9.0	25.0	------	------	------	------	------	746	------	------	.45	.45
August	25.0	143	------	0	82	74	2,610	------	------	8.0	18.0	------	------	------	------	------	592	------	------	0	.26
September	19.0	22	------	0	84	77	2,630	------	------	3.0	17.0	------	------	------	------	------	824	------	------	0	.4
October	13.0	16	------	0	69	62	5,300	------	------	5.0	10.0	------	------	------	------	------	570	------	------	0	0
Average	11.7	62	------	0	59	51	9,450	------	------	7.3	13.7	------	------	------	------	------	582	------	------	.13	.18
Maximum	25.0	183	------	0	98	81	26,600	------	------	13.0	25.0	------	------	------	------	------	824	------	------	.69	.53
Minimum	2.3	12	------	0	21	14	2,610	------	------	3.0	7.3	------	------	------	------	------	166	------	------	0	0

Table No. 57.—*Summary of monthly average operation data and laboratory results reported from each individual plant*—Continued

NEW MILFORD (N. J.) FILTRATION PLANT

Month	Operation data															
	Average volume daily of water treated	Filter operation				Coagulants (grains per gallon)									Chlorine	Average river stage
		Average length of run	Washing			Alum			Iron sulphate			Lime or soda				
			Wash water	Average time	Rate (inches per minute)	Aver-age	Maxi-mum	Mini-mum	Aver-age	Maxi-mum	Mini-mum	Aver-age	Maxi-mum	Mini-mum		
1923	*1,000 gallons*	*Hours*	*Per cent*	*Minutes*											*P. p. m.*	*Feet*
November	30,800	--------	2.1	--------	--------	1.4	2.1	1.0	--------	--------	--------	--------	--------	--------	0.2	--------
December	27,800	--------	2.1	--------	--------	1.0	1.5	.7	--------	--------	--------	--------	--------	--------	.2	--------
1924																
January	31,300	--------	2.0	--------	--------	.9	1.0	.8	--------	--------	--------	--------	--------	--------	.3	--------
February	31,300	--------	2.0	--------	--------	.7	.9	.6	--------	--------	--------	--------	--------	--------	.3	--------
March	30,000	--------	1.9	--------	--------	.7	.8	.6	--------	--------	--------	--------	--------	--------	.2	--------
April	28,900	--------	2.0	--------	--------	1.0	1.3	.6	--------	--------	--------	--------	--------	--------	.2	--------
May	27,700	--------	2.2	--------	--------	1.2	1.4	1.0	--------	--------	--------	--------	--------	--------	.3	--------
June	28,100	--------	2.2	--------	--------	1.3	1.4	1.1	--------	--------	--------	--------	--------	--------	.3	--------
July	32,600	--------	2.0	--------	--------	1.3	1.4	1.2	--------	--------	--------	--------	--------	--------	.3	--------
August	31,000	--------	2.3	--------	--------	1.3	1.4	1.1	--------	--------	--------	--------	--------	--------	.4	--------
September	30,400	--------	2.4	--------	--------	1.0	1.3	.9	--------	--------	--------	--------	--------	--------	.4	--------
October	29,100	--------	2.6	--------	--------	1.2	1.4	.9	--------	--------	--------	--------	--------	--------	.4	--------
Average	29,900	--------	2.2	--------	--------	1.1	1.3	.9	--------	--------	--------	--------	--------	--------	.3	--------
Maximum	32,600	--------	2.6	--------	--------	1.4	2.1	1.2	--------	--------	--------	--------	--------	--------	.4	--------
Minimum	27,700	--------	1.9	--------	--------	.7	.8	.6	--------	--------	--------	--------	--------	--------	.2	--------

Month	Laboratory data																				
	Water temperature	Turbidity			Alkalinity		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 cubic c. c.				
		Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
1923	° *C*																				
November	......	4.0	22.0	......	28	20	1,450	503	......	......	18	385	259	......	31	14	430	60	......	0.53	0
December	......	3.0	10.0	......	27	21	1,970	438	......	......	25	858	216	......	46	28	237	58	......	1.3	0
1924																					
January	......	4.0	6.0	......	25	20	1,920	500	......	......	16	674	245	......	41	23	84	50	......	.97	.07
February	......	1.0	4.0	......	29	24	1,290	467	......	......	16	434	264	......	41	18	27	27	......	1.0	.07
March	......	2.0	9.0	......	27	23	573	434	......	......	17	217	205	......	35	18	115	13	......	.32	0
April	......	7.0	15.0	......	20	15	659	553	......	......	17	287	241	......	28	18	133	91	......	1.0	.27
May	......	5.0	9.0	......	22	18	643	457	......	......	12	228	206	......	23	11	207	80	......	.63	0
June	......	3.0	11.0	......	36	29	604	456	......	......	15	339	304	......	42	11	125	112	......	1.0	0
July	......	3.0	6.0	......	45	36	296	499	......	......	14	234	236	......	67	22	211	210	......	3.2	0
August	......	2.0	4.0	......	53	41	371	381	......	......	17	284	291	......	51	16	162	223	......	3.9	.19
September	......	6.0	7.0	......	54	46	1,110	1,470	......	......	40	882	1,160	......	85	46	117	85	......	2.0	0
October	......	4.0	10.0	......	42	37	1,750	1,300	......	......	26	996	1,200	......	77	30	296	87	......	1.9	0
Average	......	3.7	9.4	......	34	28	1,050	622	......	......	19	485	402	......	47	21	179	91	......	1.5	.05
Maximum	......	7.0	22.0	......	54	46	1,970	1,470	......	......	40	996	1,200	......	85	46	430	223	......	3.9	.27
Minimum	......	1.0	4.0	......	20	15	296	381	......	......	12	217	205	......	23	11	27	13	......	.32	0

TABLE No. 57.—*Summary of monthly average operation data and laboratory results reported from each individual plant*—Continued

NIAGARA FALLS (N. Y.) FILTRATION PLANT

Month	Operation data															
	Average daily volume of water treated	Filter operation				Coagulants (grains per gallon)									Chlorine	Average river stage
		Average length of run	Washing			Alum			Iron sulphate			Lime or soda				
			Wash water	Average time	Rate (inches per minute)	Aver-age	Maxi-mum	Mini-mum	Aver-age	Maxi-mum	Mini-mum	Aver-age	Maxi-mum	Mini-mum		
1923	*1,000 gallons*	*Hours*	*Per cent*	*Minutes*											*P. p. m.*	*Feet*
October	11, 342	24	....	6	12. 8	0. 40	0. 7	0. 35	....	....	....	....	....	....	0. 18	....
November	10, 675	24	....	96	12. 7	. 40	. 7	. 34	....	....	....	....	....	....	. 14	....
December	10, 519	24	....	91	12. 8	. 48	. 7	. 36	....	....	....	....	....	....	. 13	....
1924																
January	11, 497	24	....	100	12. 6	. 71	1. 4	. 37	....	....	....	....	....	....	. 15	....
February	11, 645	24	....	97	12. 8	. 38	. 4	. 35	....	....	....	....	....	....	. 16	....
March	11, 438	24	....	97	12. 6	. 35	1. 2	. 34	....	....	....	....	....	....	. 15	....
April	11, 116	24	....	90	12. 7	. 40	1. 1	. 32	....	....	....	....	....	....	. 16	....
May	11, 596	24	....	252	12. 6	. 49	. 8	. 31	....	....	....	....	....	....	. 17	....
June	12, 800	24	....	294	11. 8	. 41	. 5	. 33	....	....	....	....	....	....	. 16	....
July	13, 512	24	....	164	12. 7	. 37	. 5	. 31	....	....	....	....	....	....	. 19	....
August	13, 237	24	....	97	12. 7	. 38	. 4	. 34	....	....	....	....	....	....	. 27	....
September	13, 097	24	....	99	12. 7	. 38	. 4	. 36	....	....	....	....	....	....	. 25	....
Average	11, 900	24	....	124	12. 6	. 30	. 8	. 34	....	....	....	....	....	....	. 18	....
Maximum	13, 500	24	....	294	12. 8	. 71	1. 4	. 37	....	....	....	....	....	....	. 27	....
Minimum	10, 500	24	....	6	11. 8	. 35	. 4	. 31	....	....	....	....	....	....	. 13	....

Month	Laboratory data																				
	Water temperature	Turbidity			Alkalinity		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
		Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
1923	°C.																				
October	16.0	12.0	......	11.0	95	93	7,900	......	3,090	1,060	8	......	......	......	......	......	4,810	......	1,000	13.0	0.34
November	9.0	15.0	......	10.0	99	96	7,770	......	3,300	950	8	......	......	......	......	......	2,630	......	1,010	9.8	.82
December	6.0	23.0	......	13.0	99	96	7,910	......	3,720	1,200	10	......	......	......	......	......	3,650	......	990	50.0	.36
1924																					
January	1.4	60.0	......	20.0	98	95	9,980	......	5,240	1,220	12	......	......	......	......	......	6,000	......	1,750	55.0	.82
February	1.3	25.0	......	10.0	98	95	9,880	......	4,640	1,500	23	......	......	......	......	......	5,800	......	1,820	68.0	2.0
March	1.7	18.0	......	12.0	97	94	13,200	......	7,000	2,600	21	......	......	......	......	......	5,840	......	2,010	75.0	1.3
April	1.7	28.0	......	17.0	97	93	11,300	......	5,600	1,800	18	......	......	......	......	......	41,800	......	1,550	78.0	3.0
May	7.2	24.0	......	14.0	94	91	11,800	......	5,550	1,800	16	......	......	......	......	......	4,760	......	2,470	73.0	.7
June	14.0	11.0	......	5.0	94	91	10,000	......	5,000	1,600	13	......	......	......	......	......	6,380	......	3,250	79.0	.4
July	20.1	9.9	......	5.5	94	91	10,300	......	5,400	1,300	8	......	......	......	......	......	6,080	......	2,170	61.0	.46
August	21.4	8.2	......	5.1	94	91	9,700	......	4,600	1,200	12	......	......	......	......	......	5,860	......	2,570	76.0	.57
September	18.2	12.0	......	6.7	95	93	9,800	......	7,000	1,275	17	......	......	......	......	......	5,900	......	3,200	72.0	.89
Average	9.8	21.0	......	11.0	96	93	9,960	......	5,010	1,460	14	......	......	......	......	......	8,290	......	1,980	59.0	.97
Maximum	21.4	60.0	......	20.0	99	96	13,200	......	7,000	2,600	23	......	......	......	......	......	6,389	......	3,250	79.0	3.0
Minimum	1.3	8.2	......	5.0	94	91	7,770	......	3,090	950	8	......	......	......	......	......	2,630	......	990	9.8	.34

TABLE No. 57.—*Summary of monthly average operation data and laboratory results reported from each individual plant*—Continued

TOLEDO (OHIO) FILTRATION PLANT

Month	Operation data															
	Average daily volume of water treated	Filter operation				Coagulants (grains per gallon)									Chlorine	Average river stage
		Average length of run	Washing			Alum			Iron sulphate			Lime or soda				
			Wash water	Average time	Rate (inches per minute)	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum		
1923	*1,000 gallons*	*Hours*	*Per cent*	*Minutes*											*P. p. m.*	*Feet*
August	34,300	26	2.43	4	22	--------	--------	--------	2.4	2.8	2.2	1.2	1.4	1.0	0.36	--------
September	30,325	31	2.39	4	22	--------	--------	--------	2.6	2.9	2.0	1.2	1.5	1.0	.34	--------
October	29,740	33	2.09	4	22	2.3	2.6	1.9	2.7	3.1	2.6	--------	--------	--------	.34	--------
November	28,202	47	1.59	4	22	2.0	2.6	1.5	--------	--------	--------	--------	--------	--------	.34	--------
December	28,461	41	1.87	4	23	4.3	5.5	1.8	--------	--------	--------	--------	--------	--------	.45	--------
1924																
January	35,705	24	2.48	4	23	3.8	5.5	2.8	3.7	3.8	3.6	2.0	2.1	2.0	.46	--------
February	32,267	25	2.77	4	22	--------	--------	--------	3.4	6.4	2.1	1.6	2.2	1.1	.46	--------
March	31,013	23	2.51	--------	--------	--------	--------	--------	4.3	7.1	2.2	2.0	3.4	1.3	.51	--------
April	29,846	24	2.27	4	23	--------	--------	--------	4.3	6.9	2.0	1.7	2.6	.9	.42	--------
May	29,078	28	2.64	4	22	--------	--------	--------	2.8	4.2	2.3	1.2	1.6	1.0	.37	--------
June	27,621	42	1.78	4	22	2.8	7.4	1.0	6.3	6.9	5.7	1.1	3.4	.4	.34	--------
July	29,876	47	1.46	4	22	--------	--------	--------	2.9	6.1	1.5	1.8	2.5	.6	.42	--------
Average	30,536	29	2.19	4	22	3.0	4.7	1.8	3.3	5.0	2.6	1.5	2.3	1.0	.40	--------
Maximum	35,705	47	2.77	4	23	4.3	7.4	2.8	6.3	6.9	5.7	2.0	3.4	2.0	.51	--------
Minimum	27,621	23	1.46	4	22	2.0	2.6	1.0	2.4	2.8	1.5	1.1	1.4	.4	.34	--------

Month	Laboratory data																				
	Water temperature	Turbidity			Alkalinity		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
		Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
1923	°C																				
August	23.0	55	......	15	142	132	350	......	140	70	56	290	......	105	21	32	P. 168 C. 132	......	31 21	1.3	1.2
September	20.0	75	......	15	150	136	760	......	210	65	70	390	......	155	35	40	P. 595 C. 351	......	145 80	4.7	2.5
October	13.0	59	......	12	157	136	1,280	......	320	42	26	395	......	80	14	10	P. 1,490 C. 955	......	148 87	5.3	.41
November	6.6	43	......	9	184	166	920	......	290	60	33	220	......	120	15	9	P. 577 C. 562	......	138 138	9.0	3.2
December	4.1	300	......	11	127	119	62,000	......	3,840	710	320	3,280	......	130	23	13	P. 7,240 C. 7,240	......	348 348	26.0	3.7
1924																					
January	1.0	180	......	11	126	103	30,800	......	1,180	1,180	5	1,510	......	85	22	3	P. 6,376 C. 6,376	......	145 143	21.0	.35
February	1.0	120	......	13	127	119	14,900	......	1,780	650	6	1,290	......	65	12	4	P. 928 C. 897	......	93 93	24.0	.41
March	1.7	460	......	27	111	94	39,300	......	10,200	3,670	18	2,140	......	150	28	11	P. 1,537 C. 1,183	......	118 86	25.0	.65
April	8.6	325	......	21	135	119	12,300	......	2,230	780	145	1,550	......	90	23	9	P. 1,418 C. 926	......	101 66	17.0	.73
May	14.0	115	......	19	160	146	1,380	......	225	25	30	200	......	38	7	9	P. 1,728 C. 768	......	100 58	5.9	.58
June	20.0	290	......	17	140	138	2,990	......	580	81	39	630	......	100	38	15	P. 937 C. 898	......	196 196	6.6	3.1
July	23.4	200	......	24	150	142	2,730	......	380	65	18	520	......	170	16	11	P. 740 C. 478	......	85 57	3.4	1.7
Average	11.4	185	......	16	142	128	14,100	......	1,780	616	64	1,030	......	107	21	14	P. 1,980 C. 1,730	......	137 114	12.4	1.6
Maximum	23.4	460	......	27	184	166	39,300	......	10,200	3,670	320	3,280	......	170	38	40	P. 7,240 C. 7,237	......	348 348	26.0	3.7
Minimum	1.0	43	......	9	111	94	350	......	140	25	5	200	......	38	7	3	P. 168 C. 132	......	31 21	1.3	.35

TABLE No. 57.—*Summary of monthly average operation data and laboratory results reported from each individual plant*—Continued

YOUNGSTOWN (OHIO) FILTRATION PLANT

Month	Operation data															
	Average daily volume of water treated	Filter operation				Coagulants (grains per gallon)									Chlorine	Average river stage
		Average length of run	Washing			Alum			Iron sulphate			Lime or soda				
			Wash water	Average time	Rate (inches per minute)	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum		
1923	1,000 gallons	Hours	Per cent	Minutes											P. p. m.	Feet
October	13,873	40	2.0	7.7	15	0.5	0.5	0.2	5.4	6.2	2.4	3.8	4.6	3.3	--------	(1)
November	13,212	40	1.8	8.0	15	.5	.5	.0	5.5	6.5	1.0	4.3	5.0	3.7	--------	[2] 1
December	12,893	36	2.2	7.8	15	1.6	3.0	.5	3.2	5.6	.2	3.8	4.9	2.8	--------	[2] 20
1924																
January	13,256	35	3.0	8.0	15	1.9	3.1	.5	3.4	4.2	2.6	3.6	4.4	2.9	--------	[2] 35
February	12,537	40	2.0	8.0	15	.9	2.0	.0	3.0	4.1	.0	3.7	4.6	2.9	--------	[2] 9
March	12,405	33	2.5	7.7	15	1.9	3.2	.5	2.5	3.2	2.0	3.7	4.4	3.2	--------	[2] 23
April	11,985	37	2.2	8.0	15	1.4	3.1	1.0	--------	--------	--------	3.3	3.9	2.8	--------	[2] 15
May	11,697	37	2.5	7.9	15	1.7	3.1	.5	--------	--------	--------	3.7	4.4	3.1	--------	[2] 16
June	12,467	41	1.6	7.6	15	1.4	4.5	.7	--------	--------	--------	4.1	5.3	3.5	--------	[2] 12½
July	12,771	43	1.7	7.6	15	1.9	4.0	.7	--------	--------	--------	4.0	4.7	3.0	--------	[2] 11
August	13,025	46	1.6	7.2	15	.7	1.2	.4	--------	--------	--------	3.3	4.2	2.7	--------	(1)
September	12,959	37	2.0	7.8	13	2.3	3.1	.7	--------	--------	--------	4.2	5.6	3.0	--------	[2] 10
Average	12,800	39	2.1	7.8	15	1.4	2.6	.5	3.8	5.0	1.4	3.8	4.7	3.1	--------	--------
Maximum	13,872	46	3.0	8.0	15	2.3	4.5	1.0	5.5	6.5	2.6	4.3	5.6	3.7	--------	--------
Minimum	11,697	33	1.6	7.2	13	.5	.5	.0	2.5	3.2	.0	3.3	3.9	2.7	--------	--------

Month	Laboratory data																				
	Water temperature	Turbidity			Alkalinity		Bacterial count per cubic centimeter (agar, 48 hours, 20 °C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37 °C.)					B. coli index per 100 c. c.				
		Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
1923	°C.																				
October	31	28	3.0	1.0	25	49	4,900	------	4	1.0	3.0	77,000	------	3	1.0	5.0	P. 3,430 C. 4,400	------	0.32 .32	0.0	0.0
November	20	35	7.0	2.0	50	45	4,300	------	13	.0	.0	6,700	------	13	1.0	2.0	P. 1,990 C. 3,010	------	.0 5.0	.0	.0
December	10	80	8.0	3.0	40	62	19,500	------	19	3.0	1.0	3,200	------	20	2.0	1.0	P. 6,230 C. 7,680	------	1.0 12.0	4.0	1.0
1924																					
January	6	101	11.0	5.0	30	68	7,700	------	25	1.0	1.0	2,000	------	26	1.0	1.0	P. 5,300 C. 8,260	------	.0 1.0	.0	.0
February	9	54	9.0	4.0	35	50	4,100	------	21	1.0	1.0	500	------	7	.0	.0	P. 2,430 C. 4,480	------	.0 6.0	.0	.0
March	8	80	14.0	7.0	34	61	9,000	------	45	.0	1.0	850	------	14	.0	.0	P. 3,290 C. 5,645	------	.32 3.2	.0	.0
April	14	52	15.0	7.0	35	60	6,000	------	11	1.0	1.0	1,000	------	8	1.0	.0	P. 6,400 C. 7,600	------	.66 4.3	.07	.0
May	18	52	15.0	7.0	49	57	6,100	------	25	3.0	4.0	1,500	------	16	2.0	3.0	P. 5,350 C. 7,100	------	.64 14.0	.0	.0
June	25	60	6.0	3.0	64	48	6,600	------	43	4.0	9.0	7,300	------	400	32.0	33.0	P. 6,100 C. 7,300	------	.33 1.3	.06	.0
July	27	52	9.0	5.0	52	60	21,000	------	19	2.0	3.0	16,500	------	18	3.0	1.0	P. 9,100 C. 9,700	------	.0 7.0	.13	.0
August	32	25	4.0	1.0	42	49	6,800	------	31	1.0	10.0	10,500	------	45	1.0	4.0	P. 6,800 C. 8,250	------	.0 .64	.06	.0
September	24	48	10.0	5.0	43	59	9,000	------	20	4.0	12.0	7,300	------	12	2.0	5.0	P. 9,000 C. 9,700	------	.0 7.0	.13	.0
Average	19	56	9.3	4.2	42	56	8,750	------	23	1.8	3.8	11,200	------	49	3.8	4.6	P. 5,450 C. 6,930	------	.27 5.15	.37	.08
Maximum	32	101	15.0	7.0	64	68	21,000	------	45	4.0	12.0	77,000	------	400	32.0	33.0	P. 9,100 C. 9,700	------	1.0 14.0	4.0	1.0
Minimum	6	25	3.0	1.0	25	45	4,100	------	4	.0	.0	500	------	3	.0	.0	P. 1,990 G. 3,010	------	.0 .32	.0	.0

[1] Normal.

[2] Above normal (inches).

TABLE NO. 58.—*Average results of laboratory examinations during the period of observations*

Plant	Temperature	Turbidity			Alkalinity		Bacteria per cubic centimeter, 48 hours, 20° C.				
		Raw	Settled	Applied	Raw	Applied	Raw	Settled	Applied	Filtered	Chlorinated
	°*C.*										
Albany, N. Y	9.7	13.0	......	3.3	47	28	18,000	......	4,780	195.0	13.0
Chester, Pa	......	77.0	......	9.6	37	27	......	......	......	......	......
Elmira, N. Y	11.7	62.0	......	......	59	51	9,450	......	......	7.3	14.0
New Milford, N. J	......	3.7	[1] 9.4	......	34	28	1,050	[1] 622	......	......	19.0
Niagara Falls, N. Y	9.8	21.0	......	11.0	96	93	9,960	......	5,010	1,460.0	14.0
Toledo, Ohio	11.4	185.0	......	16.0	142	128	14,100	......	1,780	616.0	64.0
Youngstown, Ohio	19.0	56.0	9.3	4.2	42	56	8,750	......	23	1.8	3.8

Plant	Bacteria per cubic centimeter, 24 hours, 37° C.					B. coli index per 100 c. c.					Period of observations (inclusive)
	Raw	Settled	Applied	Filtered	Chlorinated	Raw	Settled	Applied	Filtered	Chlorinated	
Albany, N. Y	2,550	......	813	40.0	5.1	19,400	......	864.0	2.2	0.21	October, 1923-September, 1924.
Chester, Pa	5,660	......	535	125.0	1.5	20,500	......	572.0	5.1	0	Do.
Elmira, N. Y	......	......	......	......	......	582	......	......	0.13	.18	November, 1923-October, 1924.
New Milford, N. J.	485	[1] 402	......	47.0	21.0	179	[1] 91	......	1.5	.05	Do.
Niagara Falls, N. Y.	......	......	......	......	......	8,290	......	1,980.0	59.0	.97	October, 1923-September, 1924.
Toledo, Ohio	1,030	......	107	21.0	14.0	1,730	......	114.0	12.4	1.6	August, 1923-July, 1924.
Youngstown, Ohio.	11,200	......	49	3.8	4.6	[2] 6,930	......	[2] 5.2	.4	.08	October, 1923-September, 1924.

[1] After passage through storage reservoir and canal.

[2] Gas-former index.

TABLE NO. 59.—*Average results of laboratory examinations during two different seasonal periods of equal length*

WINTER SEASON (NOVEMBER TO APRIL)

Plant	Temperature	Turbidity			Alkalinity		Bacteria per cubic centimeter, 48 hours, 20° C.				
		Raw	Settled	Coagulated	Raw	Coagulated	Raw	Settled	Coagulated	Filtered	Final
YEAR 1923-24	°*C.*										
Albany, N. Y	......	19.0	......	4.3	42	28	16,000	......	2,780	257.0	15.0
Chester, Pa	......	102.0	......	14.0	30	21	......	......	......	......	......
Elmira, N. Y	5.1	75.0	......	......	51	42	14,000	......	......	8.1	10.0
New Milford, N. J	......	3.5	11.0	......	26	21	1,310	483	......	......	18.0
Niagara Falls, N. Y	3.5	28.0	......	14.0	98	95	10,000	......	4,920	1,550.0	15.0
Toledo, Ohio	3.8	238.0	......	17.0	150	120	26,700	......	3,250	1,180.0	88.0
Youngstown, Ohio	11.0	67.0	11.0	4.7	37	58	8,430	......	22	1.0	.83

Table No. 59.—*Average results of laboratory examinations during two different seasonal periods of equal length*—Continued

WINTER SEASON (NOVEMBER TO APRIL)—Continued

Plant	Bacteria per cubic centimeter, 24 hours, 37° C.					B. coli index per 100 c. c.				
	Raw	Settled	Coagulated	Filtered	Final	Raw	Settled	Coagulated	Filtered	Final
YEAR 1923-24										
Albany, N. Y	1,200	------	234	36.0	5.2	18,700	------	660.0	1.4	0.14
Chester, Pa	4,540	------	251	8.8	1.5	19,000	------	351.0	2.6	.013
Elmira, N. Y	------	------	------	------	------	493	------	---------	.13	.08
Mew Milford, N. J	476	238	------	37.0	20.0	171	50	---------	.85	.07
Niagara Falls, N. Y	------	------	------	------	------	11,000	------	1,520.0	56.0	1.4
Toledo, Ohio	1,670	------	107	20.0	8.2	P. 3,010 C. 2,860	------ ------	157.0 146.0	24.0 20.0	2.9 1.5
Youngstown, Ohio	2,380	------	15	.83	.67	P. 4,270 C. 6,110	------ ------	.33 5.3	.68	.17

SUMMER SEASON (MAY TO OCTOBER)

YEAR 1923-24											
Albany, N. Y	------	7.3	------	2.3	51	29	20,000	------	6,770	133.0	9.8
Chester, Pa	------	52.0	------	4.9	44	33	------	------	------	------	------
Elmira, N. Y	18.3	48.0	------	------	67	60	4,860	------	------	64.0	17.0
New Milford, N. J	------	3.8	7.8	------	42	35	796	760	------	------	21.0
Niagara Falls, N. Y	16.2	13.0	------	7.9	94	92	9,920	------	5,110	1,370.0	12.0
Toledo, Ohio	18.9	132.0	------	15.0	135	138	1,580	------	309	58.0	40.0
Youngstown, Ohio	26.2	44.0	7.8	3.7	46	54	9,070	------	24	2.5	6.8

YEAR 1923-24										
Albany, N. Y	3,900	------	1,400	44.0	5.0	20,000	------	1,070.0	2.9	0.28
Chester, Pa	6,780	------	819	242.0	1.6	22,000	------	792.0	7.6	.11
Elmira, N. Y	------	------	------	------	------	671	------	---------	.14	.27
New Milford, N. J	494	566	------	58.0	23.0	186	133	---------	2.1	.032
Niagara Falls, N. Y	------	------	------	------	------	5,630	------	2,440.0	62.0	.56
Toledo, Ohio	401	------	108	22.0	20.0	P. 943 C. 597	------ ------	118.0 83.0	4.5 6.5	3.2 1.6
Youngstown, Ohio	20,000	------	82	6.8	8.5	P. 6,630 G. 7,740	------ ------	.22 5.0	.06	0

Note.—(P.) Signifies a "presumptive" result; (C.) signifies a "confirmed" result; (G.) signifies "gas-forming organism."

Table No. 60.—*Percentages which average amounts of turbidity and bacteria observed in effluents from various stages of treatment were of corresponding amounts during the period of observations*

A. OBSERVED IN RAW WATER

[Derived from yearly averages in Table No. 58]

Plant	Per cent of raw turbidity, applied	Per cent of raw count (48 hours, 20° C.)			Per cent of raw count (24 hours, 37° C.)			Per cent of raw B. coli index		
		Applied	Filtered	Chlorinated	Applied	Filtered	Chlorinated	Applied	Filtered	Chlorinated
Albany	25.4	26.6	1.1	0.072	31.9	1.6	0.20	4.4	0.011	0.001
Chester	12.5	--------	--------	--------	9.4	2.2	.03	2.8	.025	.000
Elmira	--------	--------	.08	.15	--------	--------	--------	--------	.022	.031
New Milford	--------	--------	--------	1.91	--------	9.7	4.3	--------	.084	.028
Niagara Falls	52.4	50.3	14.6	.14	--------	--------	--------	23.7	.71	.012
Toledo	8.7	12.6	4.4	.45	10.4	2.0	1.4	6.6	.72	.092
Youngstown	7.5	.26	.043	4.4	.34	.41	.08	.08	.058	.012

Table No. 60.—*Percentages which average amounts of turbidity and bacteria observed in effluents from various stages of treatment were of corresponding amounts during the period of observations*—Continued.

B. OBSERVED IN INFLUENT WATER TO EACH RESPECTIVE STAGE

[Derived from yearly averages in Table No. 58]

Plant	Per cent of influent turbidity, applied	Per cent of influent count (48 hours, 20° C.)			Per cent of influent count (24 hours, 37° C.)			Per cent of influent B. coli index		
		Applied	Filtered	Chlorinated	Applied	Filtered	Chlorinated	Applied	Filtered	Chlorinated
Albany	25.4	26.6	4.1	6.7	31.9	4.9	12.7	4.4	0.25	9.5
Chester	12.5	--------	--------	--------	9.4	23.4	1.2	2.8	.89	.0
Elmira	--------	--------	--------	100.0+	--------	--------	--------	--------	--------	100.0+
New Milford	--------	--------	--------	--------	--------	--------	45.6	--------	--------	3.3
Niagara Falls	52.4	50.3	29.2	9.6	--------	--------	--------	23.7	3.0	1.6
Toledo	8.7	12.6	34.6	10.4	10.4	19.6	66.7	6.6	10.9	12.9
Youngstown	7.5	.26	7.8	100.0+	4.4	7.8	100.0+	.08	7.7	20.0

Discussion of Data.

In the case at hand it was both impracticable and undesirable to undertake as extensive an analysis of the data as was done in that of the Ohio River plants. This was true for the reason that each plant of the series under discussion presents a more or less isolated problem; hence advantage could not be taken of the greater stability of averages derived from a combination of the data for several plants of the same type as was possible in the statistical treatment of results obtained from the survey of Ohio River plants. In the present instance no analysis of the data was justified further than showing the bacterial efficiencies accomplished by each plant, the variations in the quality of effluents produced, and, in a general way, the correlations observed between the quality of the various raw waters and that of the corresponding effluents produced from them. Although a rough comparison is possible as between the indicated limits of bacterial loading of each plant and corresponding limits derived from the study of Ohio River plants, such a comparison is at best a crude one owing to the relatively high margin of error involved in the determination of a limit of this kind from observations of the performance of a single plant of a given type.

Average Character of Raw Water and Effluents.

In Table No. 58 are given figures showing the average character of raw water and effluents of each respective plant of the group studied. These figures indicate a wide diversity of raw-water conditions encountered by the several plants and a considerable variation in the character of effluents produced by them. The mean turbidity of a majority of the raw waters is moderate as compared with that of Ohio River water and the range of variation in raw water alkalinity, though less than that of turbidity, reflects marked differences in the chemical composition of the various raw waters.

As regards bacterial content, the raw waters were found to be even more diverse than in respect to turbidity or alkalinity. A few inconsistencies were apparent as between the members of bacteria of the three respective classes observed in particular instances. An example of such inconsistencies is found in the relatively high ratio of the 20° C. bacterial count to the *B. coli* index in the raw waters of the Elmira and Toledo plants, as compared with the corresponding ratios observed at the other plants. Aside from these few inconsistencies, the figures give a fairly concordant and representative picture of the relative average conditions of raw water pollution existing at the intake of each plant, such as, for example, the highly polluted character of the raw waters at Albany and Chester, which may be classed as among the worst in the entire country in this respect, and at Youngstown and Niagara Falls, which, though lower on the scale of pollution than the two first named, are shown to be considerably more than moderately polluted bacterially. At two of the plants, namely, Elmira and New Milford, the advantages of preliminary storage are reflected in the extremely moderate degree of pollution of these two raw waters as delivered for treatment.

As to the bacterial quality of the effluents obtained at various stages of treatment, a wide diversity is shown in that of the unchlorinated filter effluents, and in this connection it should be noted that in but two instances (Elmira and Youngstown) was the average *B. coli* index of this effluent during the year of the observations indicated as being lower than the limit set by the present Treasury Department standard. A considerably greater uniformity is shown in the quality of the chlorinated effluents, all but one of which are shown by the reported figures as having conformed to the present Treasury Department standard in respect to *B. coli* content.

In Table No. 59 the average data for the two seasonal periods show no decided differences in the *B. coli* content of the various raw waters or effluents in the warmer as compared with the colder season, but one plant (Niagara Falls) producing a chlorinated effluent conforming to the Treasury Department standard gave an effluent during one of the two seasons higher in respect to *B. coli* content than the limit fixed by this standard. As regards the number of bacteria growing at 37° C., they are shown to have been consistently higher at all stages of purification during the warm season than during the colder period, the reverse being true, though not to as marked an extent, in respect to the relative numbers of bacteria growing at 20° C. These observations are in accord with corresponding ones made in the study of the Ohio River plants.

Average Indicated Efficiencies of Bacterial Removal.

The yearly and seasonal averages presented in Tables Nos. 58 and 59, respectively, provide a fair index of the mean efficiencies of bacterial removal accomplished by the various plants. In Table No. 60 the efficiencies in question, based on yearly averages given in Table No. 58, are shown in terms of the percentages which the numbers of bacteria observed in the effluents from various stages of treatment were of the corresponding numbers observed both in the raw water (No. 60A) and in the influent water to each respective stage (No. 60B).

Referring to section A of the table, considerable variation is shown in the corresponding residual percentages of bacteria observed at the different plants, though such a variation would be expected in view of the wide diversity of these plants as regards the methods of treatment employed and the character of raw water delivered to them. The reduction in numbers of *B. coli* is shown to be markedly greater at each stage of purification than the corresponding reduction in bacteria growing on plate cultures at 20° C. and 37° C. All of the plants, it may be noted, show an over-all efficiency of *B. coli* removal greater than 99 per cent without the aid of chlorination.

Comparing the over-all efficiencies of *B. coli* removal with corresponding figures based on averages for the Ohio River plants (see Table No. 31), all except one plant showed lower percentages of residual *B. coli* in the final chlorinated effluent than the mean figure for the Ohio River plants (0.09 per cent), and all except two plants gave a lower percentage in the unchlorinated effluent than the corresponding Ohio River figure (0.56 per cent). The comparative efficiencies of removal of bacteria as enumerated in the 20° C. and 37° C. plate counts were somewhat inconsistent, however, with the above findings, a larger proportion of the plants of the groups showing higher residuals than the Ohio River plants.

The extent of dependence of plants of the group under discussion on continuous chlorination of the filter effluents is illustrated by a comparison of the percentages of *B. coli* removed by this stage of treatment, as shown in Table No. 60B, with the actual reductions in numbers of this organism as shown in Table No. 58. Four of the seven plants, by the use of chlorine, reduced the *B. coli* index of their filter effluents from an excess over the number permitted by the Treasury Department standard to an index well below this figure. In Table No. 60B, four of the seven plants show a reduction of *B. coli* greater than 90 per cent by the chlorination stage of treatment alone.

In Tables Nos. 61 and 62 are given percentages of residual bacteria derived from monthly averages in Table No. 57. In the former of these two tables, the percentages are referred to the raw water count and in the latter to that of the influent water as delivered to each respective stage of treatment. For some of the plants a considerable variation is shown in the figures from month to month and for others a fair degree of constancy. The latter is true in instances such as at Chester and Niagara Falls, where the bacterial content of the raw water is not subject to as wide monthly fluctuations as is true with certain of the other plants. In Table No. 62 the efficiency of chlorination is indicated as varying widely in a number of instances, with filtration showing a greater, and the preliminary treatment, still greater, constancies in this respect. The efficiencies of removal of bacteria growing at 20° C. and 37° C. are shown to be of about the same order of magnitude, the indicated efficiency of *B. coli* removal being more or less consistently higher than that of either of the two classes of bacteria enumerated in the plate count.

TABLE No. 61.—*Percentages which the average amounts of turbidity and bacteria observed in the effluents from various stages of treatment were of the corresponding amounts observed in the raw water during each month of the period of observations*

ALBANY (N. Y.) PLANT

Month	Turbidity		48 hours, 20° C.				24 hours, 37° C.				B. coli index			
	Raw water	Per cent of raw coagulated	Raw water	Per cent of raw—			Raw water	Per cent of raw—			Raw water	Per cent of raw—		
				Coagulated	Filtered	Chlorinated		Coagulated	Filtered	Chlorinated		Coagulated	Filtered	Chlorinated
1923														
October	4.4	20.5	19,900	14.8	2.86	0.035	3,950	9.0	3.54	0.147	70,000	1.19	0.013	0.0006
November	3.9	56.4	2,870	29.6	.70	.22	1,180	14.4	1.01	.52	15,400	6.10	.028	.003
December	12.0	35.0	15,900	8.7	.10	.028	1,160	26.2	.77	.29	17,900	5.26	.002	0
1924														
January	16.0	41.3	9,900	22.2	1.6	.066	950	20.0	1.26	.51	53,500	1.11	0	0
February	4.9	65.3	7,750	37.1	10.8	.43	1,280	26.6	12.5	.51	10,300	6.4	.007	.002
March	16.0	23.7	31,000	19.0	1.4	.065	1,500	17.3	.93	.41	9,710	6.1	.016	.0005
April	60.0	9.3	28,500	12.3	.28	.074	1,100	12.7	.84	.41	5,650	4.1	.030	.002
May	21.0	19.0	17,600	101.0	.21	.033	450	55.6	.67	.047	4,750	11.3	.027	.014
June	6.5	43.1	13,600	73.3	.28	.078	1,490	68.4	2.8	.31	11,800	19.9	.040	.001
July	6.0	50.0	16,800	23.7	.46	.125	3,300	43.9	1.5	.27	12,300	8.1	.008	.0006
August	3.0	63.3	37,700	8.1	.14	.026	8,500	24.7	.25	.035	5,030	20.5	.006	.005
September	3.0	33.3	14,500	19.7	.15	.038	5,710	55.7	.18	.096	16,300	4.0	.008	.0009
Average	13	38.4	18,000	30.8	1.6	.10	2,550	31.2	2.2	.30	19,400	8.7	.015	.0025

CHESTER (PA.) PLANT

Month	Turbidity		24 hours, 37° C.				B. coli index			
	Raw water	Per cent of raw coagulated	Raw water	Per cent of raw—			Raw water	Per cent of raw—		
				Coagulated	Filtered	Chlorinated		Coagulated	Filtered	Chlorinated
1923										
October	69	14.5	10,000	12.8	2.7	0.01	22,400	3.6	0.024	0
November	77	10.4	9,700	4.5	.26	.01	26,800	1.6	.009	.0003
December	81	8.6	3,900	8.5	.18	.026	17,100	1.8	.014	0
1924										
January	160	14.4	4,300	6.3	.21	.058	23,500	1.7	.012	0
February	100	23.0	2,570	7.7	.18	.090	14,400	2.3	.010	0
March	95	15.8	2,570	6.8	.13	.050	17,900	2.1	.024	0
April	96	10.4	4,200	2.3	.088	.015	14,200	1.9	.014	0
May	52	14.2	10,000	4.5	.071	.009	22,200	3.7	.018	0
June	37	10.8	4,300	10.5	.42	.013	14,300	4.5	.049	0
July	50	6.0	6,000	14.2	12.5	.033	19,700	3.7	.046	0
August	44	6.8	6,500	7.5	3.8	.061	26,000	3.1	.038	.003
September	59	3.4	3,900	35.9	4.1	.033	27,600	3.5	.036	0
Average	77	11.5	5,660	10.1	2.1	.034	20,500	2.8	.025	.0003

Table No. 61.—*Percentages which the average amounts of turbidity and bacteria observed in the effluents from various stages of treatment were of the corresponding amounts observed in the raw water during each month of the period of observations*—Continued

ELMIRA (N. Y.) PLANT

Month	Turbidity			48 hours, 20° C.			B. coli index		
	Raw water	Per cent of raw		Raw water	Per cent of raw		Raw water	Per cent of raw	
		Settled	Coagulated		Filtered	Chlorinated		Filtered (confirmed)	Chlorinated (confirmed)
1923									
November	12	--------	--------	5,080	0.083	0.014	551	0	0
December	24	--------	--------	8,950	.11	.15	581	0	.022
1924									
January	87	--------	--------	23,800	.033	--------	674	.10	.042
February	32	--------	--------	14,500	.046	.76	555	0	0
March	114	--------	--------	26,600	.049	.041	430	0	0
April	183	--------	--------	5,300	.13	.17	166	.042	.042
May	50	--------	--------	6,380	.11	.17	479	0	0
June	29	--------	--------	5,990	.10	.32	817	.049	.065
July	31	--------	--------	6,330	.14	.40	746	.06	.06
August	142	--------	--------	2,610	.31	.69	592	0	.044
September	22	--------	--------	2,630	.11	.65	824	0	.49
October	16	--------	--------	5,200	.096	.19	570	0	0
Average	62	--------	--------	9,450	.11	.32	582	.021	.064

NEW MILFORD (N. J.) PLANT

Month	Turbidity		48 hours, 20° C.			24 hours, 37° C.				B. coli index			
	Raw water	Per cent of raw settled	Raw water	Per cent of raw		Raw water	Per cent of raw			Raw water	Per cent of raw		
				Settled	Chlorinated		Settled	Filtered	Chlorinated		Settled	Filtered (confirmed)	Chlorinated (confirmed)
1923													
November	4	55.0	1,450	34.7	1.2	385	67.3	8.1	3.6	430	14.0	0.12	0
December	3	333.0	1,970	22.2	1.3	858	25.2	5.4	3.3	237	24.5	.55	0
1924													
January	4	150.0	1,920	26.0	.83	674	36.4	6.1	3.4	84	59.5	1.2	.083
February	1	400.0	1,290	36.2	1.2	434	60.8	9.4	4.1	27	100.0	3.7	.26
March	2	450.0	573	75.7	3.0	217	94.5	16.1	8.3	115	11.3	.28	0
April	7	214.0	659	83.9	2.6	287	84.0	9.7	6.3	133	68.4	.75	.20
May	5	180.0	643	71.1	1.9	228	90.3	10.1	4.8	207	38.6	.30	0
June	3	367.0	604	75.5	2.5	339	89.7	12.4	3.2	125	89.6	.80	0
July	3	200.0	296	169.0	4.7	234	101.0	28.6	9.4	211	99.5	1.5	0
August	2	200.0	371	103.0	4.6	284	102.0	18.0	5.6	162	138.0	2.4	.12
September	6	117.0	1,110	133.0	3.6	882	132.0	9.6	5.2	117	72.7	1.7	0
October	4	250.0	1,750	74.5	1.5	996	120.0	7.7	3.0	296	29.4	.64	0
Average	3.7	284.0	1,050	75.4	2.4	485	83.6	11.8	5.0	179	62.1	1.1	.055

Table No. 61.—*Percentages which the average amounts of turbidity and bacteria observed in the effluents from various stages of treatment were of the corresponding amounts observed in the raw water during each month of the period of observations*—Continued

NIAGARA FALLS (N. Y.) PLANT

Month	Turbidity		48 hours, 20° C.				B. coli index			
				Per cent of raw				Per cent of raw		
	Raw water	Per cent of raw (coagulated)	Raw water	Coagulated	Filtered	Chlorinated	Raw water	Coagulated	Filtered (confirmed)	Chlorinated (confirmed)
1923										
October	12	91.7	7,900	39.1	13.4	0.10	4,810	20.8	0.27	0.007
November	15	66.7	7,770	42.5	12.2	.10	2,630	38.4	.37	.031
December	23	51.5	7,910	47.0	15.2	.13	3,650	27.1	1.4	.01
1924										
January	60	33.3	9,980	52.5	12.2	.12	6,000	29.2	.92	.014
February	25	40.0	9,880	47.0	15.5	.23	5,800	31.4	1.1	.034
March	18	66.7	13,200	53.0	19.7	.16	5,840	34.4	1.3	.022
April	28	60.7	11,300	49.5	15.9	.16	41,800	3.7	.19	.007
May	24	58.3	11,800	47.0	15.2	.13	4,760	51.9	1.5	.015
June	11	45.5	10,000	50.0	16.0	.13	6,380	50.9	1.2	.006
July	9.9	55.6	10,300	52.4	12.6	.078	6,080	35.7	1.0	.008
August	8.2	62.2	9,700	47.4	12.4	.12	5,860	43.9	1.3	.01
September	12	55.8	9,800	71.4	13.0	.17	5,900	54.2	1.2	.015
Average	21	57.8	9,960	49.9	14.4	.14	8,290	35.1	.98	.015

TOLEDO (OHIO) PLANT

[P.=presumptive; C.=confirmed]

Month	Turbidity		48 hours, 20° C.				24 hours, 37° C.				B. coli index					
				Per cent of raw				Per cent of raw				Per cent of raw				
													Filtered		Chlorinated	
	Raw water	Per cent of raw, coagulated	Raw water	Coagulated	Filtered	Chlorinated	Raw water	Coagulated	Filtered	Chlorinated	Raw water	Coagulated	Presumptive	Confirmed	Presumptive	Confirmed
1923																
August	55	27.3	350	40.0	20.0	16.0	290	36.2	7.2	11.0	P. 168 C. 132	18.5 15.9	1.0	0.98	1.3	0.91
September	75	20.0	760	27.6	8.5	9.2	390	39.7	9.0	10.3	P. 59[illegible] C. 351	24.4 22.8	1.1	1.3	.69	.71
October	59	20.3	1,[illegible]30	25.0	3.3	2.0	375	21.3	3.7	2.7	P. 1,490 C. 955	9.9 9.1	.53	.55	.25	.043
November	43	20.9	920	31.5	6.5	3.6	220	54.5	6.8	4.1	P. 577 C. 562	23.9 24.6	1.6	1.6	.81	.57
December	300	3.7	62,000	6.2	1.1	.52	3,280	4.0	.70	.40	P. 7,240 C. 7,240	4.8 4.8	.36	.36	.095	.051
1924																
January	180	6.1	30,800	3.8	3.8	.016	1,510	5.6	1.5	.20	P. 6,376 C. 6,376	2.3 2.2	.33	.33	.015	.005
February	120	10.8	14,900	11.9	4.4	.040	1,290	5.0	.93	.31	P. 928 C. 897	10.0 10.4	2.7	2.7	.11	.046
March	460	5.9	39,300	26.0	9.3	.046	2,140	7.0	1.3	.51	P. 1,537 C. 1,183	7.7 7.3	2.2	2.1	.12	.055
April	325	6.5	12,300	18.1	6.3	1.2	1,550	5.8	1.5	.58	P. 1,418 C. 926	7.1 7.1	2.0	1.8	.14	.079
May	115	16.5	1,380	16.3	1.8	2.2	200	19.0	3.5	4.5	P. 1,728 C. 768	5.8 7.6	.58	.77	.13	.076
June	290	5.9	2,990	19.4	2.7	1.3	630	15.9	6.0	2.4	P. 937 C. 898	20.9 21.8	.75	.73	.44	.35
July	200	12.0	2,730	13.9	2.4	.66	520	32.7	3.1	2.1	P. 740 C. 478	11.4 11.9	.80	.71	.38	.35
Average	185	13.0	14,100	20.0	5.8	3.1	1,030	20.6	3.8	3.3	P. 1,980 C. 1,650	12.2 12.1	1.2	1.2	.37	.27

Table No. 61.—*Percentages which the average amounts of turbidity and bacteria observed in the effluents from various stages of treatment were of the corresponding amounts observed in the raw water during each month of the period of observations*—Continued

YOUNGSTOWN (OHIO) PLANT

[P.=presumptive; G.=gas formers]

Month	Turbidity			48 hours, 20° C.				24 hours, 37° C.				B. coli index					
		Per cent of raw			Per cent of raw				Per cent of raw				Per cent of raw				
														Filtered		Chlorinated	
	Raw water	Settled	Coagulated	Raw water	Coagulated	Filtered	Chlorinated	Raw water	Coagulated	Filtered	Chlorinated	Raw water	Coagulated	Presumptive	Confirmed	Presumptive	Confirmed
1923 October	28	10.7	3.6	4,900	0.082	0.020	0.061	77,000	0.004	0.001	0.006	P. 3,430 G. 4,400	0.009 .007	0	0	0	0
November	35	20.0	5.7	4,300	.30	0	0	6,700	.19	.015	.080	P. 1,990 G. 3,010	0 .17	0	0	0	0
December	80	10.0	3.8	19,500	.097	.015	.005	3,200	.63	.063	.031	P. 6,230 G. 7,680	.016 .16	.016	.064	0	.016
1924 January	101	10.9	4.9	7,700	.32	.013	.013	2,000	1.3	.05	.05	P. 5,300 G. 8,260	0 .012	0	0	0	0
February	54	16.7	7.4	4,100	.51	.024	.024	500	1.4	0	0	P. 2,430 G. 4,480	0 .13	0	0	0	0
March	80	17.5	8.8	9,000	.50	0	.011	850	1.6	0	0	P. 3,290 G. 5,640	.01 .057	0	0	0	0
April	52	28.8	13.5	6,000	.18	.017	.017	1,000	.8	.1	0	P. 6,400 G. 7,600	.01 .057	0	.01	0	0
May	52	28.8	13.5	6,100	.41	.049	.066	1,500	1.1	.13	.20	P. 5,350 G. 7,100	.012 .20	0	0	0	0
June	60	10.0	5.0	6,600	.65	.061	.14	7,300	5.5	.44	.45	P. 6,100 G. 7,300	.005 .018	0	.001	0	0
July	52	17.3	9.6	21,000	.090	.009	.014	16,500	.11	.018	.006	P. 9,100 G. 9,700	0 .072	0	.001	0	0
August	25	16.0	4.0	6,800	.46	.015	.15	10,500	.43	.009	.038	P. 6,800 G. 8,250	0 .008	0	.0009	0	0
September	48	20.8	10.4	9,000	.22	.044	.133	7,300	.16	.027	.068	P. 9,000 G. 9,700	0 .072	.007	.001	0	0
Average	56	17.3	7.5	8,690	.32	.022	.053	11,200	1.1	.071	.073	P. 5,450 G. 6,930	.005 .080	.002	.007	0	.001

TABLE NO. 62.—*Percentages which the average amounts of turbidity and bacteria observed in the effluents from various stages of treatment were of the corresponding amounts observed in the influent water to each respective stage during each month of the period of observations*

ALBANY (N. Y.) PLANT

Month	Turbidity		48 hours, 20° C.				24 hours, 37° C.				B. coli index			
				Per cent of influent				Per cent of influent				Per cent of influent		
	Raw water	Per cent influent, coagulated	Raw water	Coagulated	Filtered	Chlorinated	Raw water	Coagulated	Filtered	Chlorinated	Raw water	Coagulated	Filtered (confirmed)	Chlorinated (confirmed)
1923														
October	4.4	20.5	19,900	14.8	19.3	1.2	3,950	9.0	39.4	4.1	40,000	1.19	1.1	4.6
November	3.9	56.4	2,870	29.6	2.4	32.0	1,180	14.4	7.1	50.8	15,400	6.10	.46	10.0
December	12.0	35.0	15,900	8.7	1.1	27.5	1,160	26.2	2.9	3.8	17,900	5.26	.034	0
1924														
January	16.0	41.3	9,900	22.2	7.3	4.1	950	20.0	6.3	40.0	53,500	1.11	0	0
February	4.9	65.3	7,750	37.1	29.2	3.9	1,280	26.6	47.0	4.1	10,300	6.4	.10	36.2
March	16.0	23.7	31,000	19.0	7.2	4.7	1,500	17.3	5.4	4.3	9,710	6.1	.27	3.1
April	60.0	9.3	28,500	12.3	2.3	26.3	1,100	12.7	6.6	48.9	5,650	4.1	.73	5.3
May	21.0	19.0	17,600	101.0	.21	15.7	450	55.6	1.2	70.0	4,750	11.3	.24	51.5
June	6.5	43.1	13,600	73.3	.38	27.9	1,490	68.4	4.0	11.2	11,800	19.9	.20	3.2
July	6.0	50.0	16,800	23.7	1.9	27.2	3,300	43.9	3.3	18.8	12,300	8.1	.094	7.4
August	3.0	63.3	37,700	8.1	1.7	18.9	8,500	24.7	1.0	14.3	5,030	20.5	.031	78.1
September	3.0	33.3	14,500	19.7	.77	25.0	5,710	55.7	.31	55.0	16,300	4.0	.20	11.5
Average	13	38.4	18,000	30.8	6.1	17.9	2,550	31.2	10.4	27.1	19,400	8.7	.29	17.6

CHESTER (PA.) PLANT

Month	Turbidity		24 hours, 37° C.				B. coli index			
				Per cent of influent				Per cent of influent		
	Raw water	Percent of influent coagulated	Raw water	Coagulated	Filtered	Chlorinated	Raw water	Coagulated	Filtered (confirmed)	Chlorinated (confirmed)
1923										
October	69	14.5	10,000	12.8	21.2	0.37	22,400	3.6	0.67	0
November	77	10.4	9,700	4.5	5.7	4.0	26,800	1.6	.53	3.5
December	81	8.6	3,900	8.5	2.1	14.3	17,100	1.8	.78	0
1924										
January	160	14.4	4,300	6.3	3.3	28.1	23,500	1.7	.71	0
February	100	23.0	2,570	7.7	2.3	50.0	14,400	2.3	.45	0
March	95	15.8	2,570	6.8	1.9	39.4	17,900	2.1	1.2	0
April	96	10.4	4,200	2.3	3.9	16.8	14,200	1.9	.74	0
May	52	14.2	10,000	4.5	1.6	12.1	22,200	3.7	.50	0
June	37	10.8	4,300	10.5	4.0	3.1	14,300	4.5	1.1	0
July	50	6.0	6,000	14.2	88.2	.27	19,700	3.7	1.2	0
August	44	6.8	6,500	7.5	50.5	1.6	26,000	3.1	1.3	6.7
September	59	3.4	3,900	35.9	11.4	.81	27,600	3.5	1.0	0
Average	77	11.5	5,660	10.1	16.3	14.2	20,500	2.8	.85	.85

Table No. 62.—*Percentages which the average amounts of turbidity and bacteria observed in the effluents from various stages of treatment were of the corresponding amounts observed in the influent water to each respective stage during each month of the period of observations*—Continued

ELMIRA (N. Y.) PLANT

Month	Turbidity, raw water	48 hours, 20° C.			B. coli index		
		Raw water	Per cent of influent		Raw water	Per cent of influent	
			Filtered	Chlorinated		Filtered confirmed	Chlorinated confirmed
1923							
November	12	5,080	0.083	174.0	551	0	0
December	24	8,950	.11	133.0	581	0	(1)
1924							
January	87	23,800	.033	----------	674	.10	40.6
February	32	14,500	.046	164.0	555	0	0
March	114	26,600	.049	84.6	430	0	0
April	183	5,300	.13	124.0	166	.042	100.0
May	50	6,380	.11	150.0	479	0	0
June	29	5,990	.10	317.0	817	.049	133.0
July	31	6,330	.14	278.0	746	.06	100.0
August	143	2,610	.31	225.0	592	0	(1)
September	22	2,630	.11	567.0	824	0	(1)
October	16	5,200	.096	200.0	570	0	0
Average	62	9,450	.11	220.0	582	.021	41.5

[1] Increase in final effluent.

NEW MILFORD (N. J.) PLANT

Month	Turbidity		48 hours, 20° C.		
	Raw water	Per cent of influent settled	Raw water	Per cent of influent	
				Settled	Chlorinated
1923					
November	4	550.0	1,450	34.7	3.6
December	3	333.0	1,970	22.2	5.7
1924					
January	4	150.0	1,920	26.0	3.2
February	1	400.0	1,290	36.2	3.4
March	2	450.0	573	75.7	3.9
April	7	214.0	659	83.9	3.1
May	5	180.0	643	71.1	2.6
June	3	367.0	604	75.5	3.3
July	3	200.0	296	169.0	2.8
August	2	200.0	371	103.0	4.5
September	6	117.0	1,110	133.0	2.7
October	4	250.0	1,750	74.5	2.0
Average	3.7	284.0	1,050	75.4	3.4

Table No. 62.—*Percentages which the average amounts of turbidity and bacteria observed in the effluents from various stages of treatment were of the corresponding amounts observed in the influent water to each respective stage during each month of the period of observations*—Continued

ELMIRA (N. Y.) PLANT

Month	Turbidity, raw water	48 hours, 20° C.			B. coli index		
		Raw water	Per cent of influent		Raw water	Per cent of influent	
			Filtered	Chlorinated		Filtered confirmed	Chlorinated confirmed
1923							
November	12	5,080	0.083	174.0	551	0	0
December	24	8,950	.11	133.0	581	0	(1)
1924							
January	87	23,800	.033	--------	674	.10	40.6
February	32	14,500	.046	164.0	555	0	0
March	114	26,600	.049	84.6	430	0	0
April	183	5,300	.13	124.0	166	.042	100.0
May	50	6,380	.11	150.0	479	0	0
June	29	5,990	.10	317.0	817	.049	133.0
July	31	6,330	.14	278.0	746	.06	100.0
August	143	2,610	.31	225.0	592	0	(1)
September	22	2,630	.11	567.0	824	0	(1)
October	16	5,200	.096	200.0	570	0	0
Average	62	9,450	.11	220.0	582	.021	41.5

[1] Increase in final effluent.

NEW MILFORD (N. J.) PLANT

Month	Turbidity		48 hours, 20° C.		
	Raw water	Per cent of influent settled	Raw water	Per cent of influent	
				Settled	Chlorinated
1923					
November	4	550.0	1,450	34.7	3.6
December	3	333.0	1,970	22.2	5.7
1924					
January	4	150.0	1,920	26.0	3.2
February	1	400.0	1,290	36.2	3.4
March	2	450.0	573	75.7	3.9
April	7	214.0	659	83.9	3.1
May	5	180.0	643	71.1	2.6
June	3	367.0	604	75.5	3.3
July	3	200.0	296	169.0	2.8
August	2	200.0	371	103.0	4.5
September	6	117.0	1,110	133.0	2.7
October	4	250.0	1,750	74.5	2.0
Average	3.7	284.0	1,050	75.4	3.4

Table No. 62.—*Percentages which the average amounts of turbidity and bacteria observed in the effluents from various stages of treatment were of the corresponding amounts observed in the influent water to each respective stage during each month of the period of observations*—Continued

NEW MILFORD (N. J.) PLANT—Continued

Month	24 hours, 37° C.				B. coli index			
	Raw water	Per cent of influent			Raw water	Per cent of influent		
		Settled	Filtered	Chlorinated		Settled	Filtered	Chlorinated
1923								
November	385	67.3	12.0	45.2	430	14.0	0.88	0
December	858	25.2	21.3	60.9	237	24.5	2.2	0
1924								
January	674	36.4	16.7	56.1	84	59.5	1.9	7.2
February	434	60.8	15.5	43.9	27	100.0	3.7	7.0
March	217	94.5	17.1	51.4	115	11.3	2.5	0
April	287	84.0	11.6	64.3	133	68.4	1.1	27.0
May	228	90.3	11.1	47.8	207	38.6	.79	0
June	339	89.7	13.8	26.2	125	89.6	.89	0
July	234	101.0	28.4	32.8	211	99.5	1.5	0
August	284	102.0	17.5	31.4	162	138.0	1.7	4.9
September	882	132.0	7.3	54.1	117	72.7	2.4	0
October	996	120.0	6.4	39.0	296	29.4	2.2	0
Average	485	83.6	14.9	46.1	179	62.1	1.8	3.

NIAGARA FALLS (N. Y.) PLANT

Month	Turbidity		48 hours, 20° C				B. coli index			
	Raw water	Per-cent of influent, coagulated	Raw water	Percent of influent			Raw water	Percent of influent		
				Coagulated	Filtered	Chlorinated		Coagulated	Filtered (confirmed)	Chlorinated (confirmed)
1923										
October	12.0	91.7	7,900	39.1	34.3	0.75	4,810	20.8	1.3	2.6
November	15.0	66.7	7,770	42.5	28.8	.84	2,680	38.4	.97	8.4
December	23.0	56.5	7,910	47.0	32.3	.83	3,650	27.1	5.1	.72
1924										
January	60.0	33.3	9,980	52.5	23.3	.98	6,000	29.2	3.1	1.5
February	25.0	40.0	9,880	47.0	33.0	1.5	5,800	31.4	3.7	2.9
March	18.0	66.7	13,200	53.0	37.1	.81	5,840	34.4	3.7	1.7
April	28.0	60.7	11,300	49.5	32.1	1.0	41,800	3.7	5.0	3.8
May	24.0	58.3	11,800	47.0	32.7	.89	4,760	51.9	2.9	.96
June	11.0	45.5	10,000	50.0	32.0	.81	6,380	50.9	2.4	.51
July	9.9	55.6	10,300	52.4	24.1	.62	6,080	35.7	2.8	.75
August	8.2	62.2	9,700	47.4	26.1	1.0	5,860	43.9	3.0	.75
September	12.0	55.8	9,800	71.4	18.2	1.3	5,900	54.2	2.3	1.2
Average	21.0	57.8	9,960	49.9	29.5	.94	8,290	35.1	3.02	2.1

Table No. 62.—*Percentages which the average amounts of turbidity and bacteria observed in the effluents from various stages of treatment were of the corresponding amounts observed in the influent water to each respective stage during each month of the period of observations*—Continued

TOLEDO (OHIO) PLANT

[P.=presumptive; C.=confirmed]

Month	Turbidity		48 hours, 20° C.			
	Raw water	Per cent of influent—Coagulated	Raw water	Per cent of influent		
				Coagulated	Filtered	Chlorinated
1923						
August	55	27.3	350	40.0	50.0	80.0
September	75	20.0	760	27.6	30.9	108.0
October	59	20.3	1,280	25.0	13.1	61.9
November	43	20.9	920	31.5	20.7	55.0
December	300	3.7	62,000	6.2	18.5	45.1
1924						
January	180	6.1	30,800	3.8	100.0	.42
February	120	10.8	14,900	11.9	36.5	.92
March	460	5.9	39,300	26.0	36.0	.49
April	325	6.5	12,300	18.1	35.0	18.6
May	115	16.5	1,380	16.3	11.1	120.0
June	290	5.9	2,990	19.4	14.0	48.1
July	200	12.0	2,730	13.9	17.1	27.7
Average	185	13.0	14,100	20.0	31.9	47.2

Month	24 hours, 37° C.				B. coli index					
	Raw water	Per cent of influent			Raw water	Per cent of influent				
						Coagulated	Filtered		Chlorinated	
		Coagulated	Filtered	Chlorinated			Presumptive	Confirmed	Presumptive	Confirmed
1923										
August	290	36.2	20.0	152.0	P. 168 C. 132	18.5 15.9	5.5	6.2	129	92.3
September	390	39.7	22.6	114.0	P. 595 C. 351	24.4 22.8	4.4	5.9	64.1	53.2
October	375	21.3	17.5	71.4	P. 1,490 C. 955	9.9 9.1	5.3	6.1	48.1	7.7
November	220	54.5	12.5	60.0	P. 577 C. 562	23.9 24.6	6.7	6.5	50.5	35.6
December	3,280	4.0	17.7	56.5	P. 7,240 C. 7,240	4.8 4.8	7.5	7.5	26.5	14.2
1924										
January	1,510	5.6	25.9	13.6	P. 6,376 C. 6,376	2.3 2.2	14.5	14.7	4.6	1.7
February	1,290	5.0	18.5	33.3	P. 928 C. 897	10.0 10.4	20.9	25.8	4.1	1.7
March	2,140	7.0	18.7	39.3	P. 1,537 C. 1,183	7.7 7.3	28.8	29.1	5.3	2.6
April	1,550	5.8	25.5	39.1	P. 1,418 C. 926	7.1 7.1	28.7	25.8	6.7	4.3
May	200	19.0	18.4	129.0	P. 1,728 C. 768	5.8 7.6	10.0	10.2	23.2	9.8
June	630	15.9	38.0	39.5	P. 937 C. 898	20.9 21.8	3.6	3.4	59.0	47.6
July	520	32.7	9.4	68.8	P. 740 C. 478	11.4 11.9	6.9	6.0	48.1	49.4
Average	1,030	20.6	20.4	68.0	P. 1,980 C. 1,650	12.2 12.1	12.4	12.3	39.1	26.7

Table No. 62.—*Percentages which the average amounts of turbidity and bacteria observed in the effluents from various stages of treatment were of the corresponding amounts observed in the influent water to each respective stage during each month of the period of observations*—Continued

YOUNGSTOWN (OHIO) PLANT

[P.=presumptive; G.=gas formers]

Month	Turbidity		48 hours, 20° C.			
				Per cent of influent		
	Raw water	Per cent of influent settled	Raw water	Coagulated	Filtered	Chlorinated
1923						
October	28	10.7	4,900	0.082	25.0	300.0
November	35	20.0	4,300	.30	0	0
December	80	10.0	19,500	.097	15.8	33.3
1924						
January	101	10.9	7,700	.32	4.0	100.0
February	54	16.7	4,100	.51	4.8	100.0
March	80	17.5	9,000	.50	0	(1)
April	52	28.8	6,000	.18	9.1	100.0
May	52	28.8	6,100	.41	12.0	133.0
June	60	10.0	6,600	.65	9.3	225.0
July	52	17.3	21,000	.09	10.5	150.0
August	25	16.0	6,800	.46	3.2	1,000.0
September	48	20.8	9,000	.22	20.0	300.0
Average	56	17.3	8,690	.32	9.5	222.0

Month	24 hours, 37° C.				B. coli index					
		Per cent of influent				Per cent of influent				
							Filtered		Chlorinated	
	Raw water	Coagulated	Filtered	Chlorinated	Raw water	Coagulated	Presumptive	Confirmed	Presumptive	Confirmed
1923										
October	77,000	0.004	33.3	500.0	P. 3,430 G. 4,400	0.009 .007	0	0	0	0
November	6,700	.19	7.7	200.0	P. 1,990 G. 3,010	0 .17	0	0	0	0
December	3,200	.63	10.0	50.0	P. 6,230 G. 7,680	.316 .16	100.0	33.3	0	25.0
1924										
January	2,000	1.3	3.8	100.0	P. 5,300 G. 8,260	0 .02	0	0	0	0
February	500	1.4	0	0	P. 2,430 G. 4,480	0 .13	0	0	0	0
March	850	1.6	0	0	P. 3,290 G. 5,640	.01 .057	0	0	0	0
April	1,000	.8	12.5	0	P. 6,400 G. 7,600	.01 .057	0 0	1.5	0	0
May	1,500	1.1	12.5	150.0	P. 5,350 G. 7,100	.012 .20	0	0	0	0
June	7,300	5.5	8.0	103.0	P. 6,100 G. 7,300	.005 .018	0	4.6	0	0
July	16,500	.11	16.7	33.3	P. 9,100 G. 9,700	0 .072	0	1.8	0	0
August	10,500	.43	2.2	400.0	P. 6,800 G. 8,250	0 .008	0	10.0	0	0
September	7,300	.16	16.7	250.0	P. 9,000 G. 9,700	0 .072	(1)	1.9	0	0
Average	11,200	1.1	10.3	149.0	P. 5,450 G. 6,930	.005 .080	9.1	4.4	0	2.1

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[1] Increase.

Relations Between Numbers of Bacteria in the Raw Waters and Corresponding Numbers in the Effluents From Various Stages of Treatment

In Tables Nos. 63, 64, and 65 are given summarized results of the correlations made between the numbers of bacteria observed in the raw waters of the various plants and the corresponding numbers observed in the effluents from successive stages of treatment. These correlations were made by the same method of grouping as was used and described in previous sections of this report. (See pp. 85–88.) In Table No. 63 the results have been derived from the 48-hour counts at 20° C., in Table No. 64 from the 24-hour counts at 37° C., and in Table No. 65 from the *B. coli* index data. In every case the basis of the correlation consisted in groupings of the daily numbers of bacteria and *B. coli* falling within the raw-water ranges indicated.

Table No. 63.—*Relations between averages of numbers of bacteria in raw water falling within specified ranges and averages of corresponding numbers in effluents from various stages of treatments*

(Bacterial counts, 48 hours, 20° C.)

Raw-water count range	Number of items	Average bacteria count per cubic centimeter				Per cent of raw-water count		
		Raw	Applied	Filtered	Chlorinated	Applied	Filtered	Chlorinated
ALBANY								
0–2,500	43	1,750	1,180.0	150.0	5.9	67.5	8.6	0.34
2,501–5,000	73	3,900	1,690.0	224.0	10.2	43.3	5.7	.26
5,001–10,000	84	7,720	2,490.0	184.0	11.5	32.3	2.4	.15
10,001–20,000	97	14,300	6,040.0	165.0	15.4	42.2	1.2	.11
Over 20,000	69	60,100	11,400.0	233.0	16.1	19.0	.39	.027
ELMIRA								
0–3,000	117	1,950	----------	4.6	12.9	----------	0.24	0.66
3,001–5,000	46	3,980	----------	5.8	14.1	----------	.15	.35
5,001–10,000	73	7,140	----------	7.7	15.1	----------	.11	.21
10,001–20,000	68	13,700	----------	8.1	10.1	----------	.059	.073
Over 20,000	47	32,100	----------	13.1	10.8	----------	.041	.034
NEW MILFORD								
0–500	128	284	488.0	----------	17.0	100.0+	----------	6.0
501–750	76	619	574.0	----------	20.0	92.8	----------	3.2
751–1,500	83	980	665.0	----------	19.0	67.8	----------	1.9
Over 1,500	67	3,500	893.0	----------	25.0	25.5	----------	.71
NIAGARA FALLS								
0–6,500	25	5,730	2,410.0	780.0	6.7	42.0	13.6	1.2
6,501–7,500	30	7,090	2,560.0	858.0	9.6	36.1	12.1	1.4
7,501–8,500	48	8,100	3,360.0	1,080.0	11.0	41.5	13.3	1.4
8,501–9,500	85	9,250	4,190.0	1,200.0	13.0	45.3	13.0	1.4
Over 9,500	177	12,100	6,240.0	1,980.0	16.7	51.6	16.4	1.4
TOLEDO								
0–250	25	194	103.0	52.0	33.0	53.1	26.8	17.0
251–500	70	400	166.0	55.0	44.0	41.5	13.8	11.0
501–1,000	66	784	251.0	53.0	41.0	32.0	6.8	5.2
1,001–10,000	115	3,450	722.0	146.0	45.0	21.0	4.2	1.3
Over 10,000	90	53,700	6,740.0	2,240.0	129.0	12.6	4.2	2.4
YOUNGSTOWN								
0–800	51	476	2.0	0.5	1.2	0.42	0.11	0.25
801–2,300	63	1,480	4.7	.8	1.0	.32	.054	.068
2,301–5,000	91	3,340	19.0	1.2	4.8	.57	.036	.14
5,001–13,000	93	8,710	33.0	2.1	3.3	.38	.024	.038
Over 13,000	68	25,000	49.0	3.7	7.6	.20	.015	.030

TABLE No. 64.—*Relations between averages of numbers of bacteria in raw water falling within specified ranges and averages of corresponding numbers observed in effluents from various stages of treatment*

(Bacterial counts, 24 hours, 37° C.)

Raw-water count range	Number of items	Average bacteria count per cubic centimeter				Per cent of raw-water count		
		Raw	Applied	Filtered	Chlorinated	Applied	Filtered	Chlorinated
ALBANY								
0-500	83	312	237.0	32.0	3.4	76.0	10.3	1.1
501-1,000	81	783	274.0	16.0	4.9	35.0	2.0	.63
1,001-2,000	81	1,510	464.0	36.0	5.4	30.8	2.4	.36
Over 2,000	121	5,970	1,800.0	63.0	5.9	30.2	1.1	.10
CHESTER								
0-1,000	50	750	240.0	28.0	1.1	32.0	3.7	0.15
1,001-3,000	71	2,070	482.0	95.0	1.0	23.3	4.6	.048
3,001-5,000	48	3,950	467.0	84.0	1.6	11.8	2.1	.041
5,001-10,000	54	7,350	732.0	168.0	2.1	10.0	2.3	.029
Over 10,000	24	27,100	616.0	67.0	2.6	2.3	2.5	.010
NEW MILFORD								
0-175	109	89	159.0	32.0	12.0	100.0+	36.0	13.5
176-300	89	229	476.0	44.0	20.0	100.0+	19.2	8.7
301-600	86	432	368.0	57.0	26.0	85.2	13.2	6.0
Over 600	70	1,510	727.0	65.0	34.0	48.2	4.3	2.4
TOLEDO								
0-100	95	70	45.0	12.0	6.9	64.3	17.2	9.7
101-250	97	184	66.0	13.0	10.1	35.9	7.1	5.5
251-500	86	385	108.0	22.0	20.4	28.1	5.7	5.3
501-2,000	91	1,130	140.0	27.0	15.5	12.4	2.4	1.4
Over 2,000	47	4,720	193.0	36.0	13.8	4.1	.76	.29
YOUNGSTOWN								
0-400	49	252	2.2	0.33	0.27	0.87	0.13	0.11
401-800	64	637	8.3	.81	1.14	1.3	.13	.18
801-1,700	75	1,270	24.0	.87	1.2	1.9	.07	.09
1,701-5,000	81	3,060	19.0	1.9	3.8	.62	.06	.12
Over 5,000	96	39,000	144.0	11.7	13.0	.37	.03	.03

Table No. 65.—*Relations between averages of numbers of B. coli in raw water falling within specified ranges and averages of corresponding numbers observed in effluents at various stages of treatment*

Raw water B. coli index range		Number of items	Average B. coli index per 100 cubic centimeters				Per cent of raw-water index		
From—	To—		Raw	Applied	Filtered	Chlorinated	Applied	Filtered	Chlorinated
ALBANY									
100	999	6	100	100.0	1.7	0	100.0	1.7	0
1,000	9,999	141	1,000	581.0	1.3	.16	58.1	.13	.016
10,000	99,999	182	10,000	1,070.0	2.1	.16	10.7	.021	.0016
100,000	----------	37	100,000	1,130.0	6.0	.51	1.1	.006	.0005
CHESTER									
100	999	7	914	600.0	4.7	0	65.7	0.51	0
1,000	9,999	149	6,190	477.0	4.9	.03	7.9	.079	.0005
10,000	----------	133	36,300	563.0	5.1	.09	1.6	.014	.0002
ELMIRA									
0	100	90	51	----------	0	0	----------	0	0
101	500	69	375	----------	.09	.14	----------	.025	.037
501	1,000	70	695	----------	.20	.20	----------	.029	.029
1,000	----------	142	1,000	----------	.20	.28	----------	.020	.028
NEW MILFORD									
1	9	74	1	----------	0.41	0	----------	41.0	0
10	99	136	10	----------	1.2	.03	----------	12.0	.30
100	999	94	100	----------	2.0	.13	----------	2.0	.13
1,000	----------	50	1,000	----------	3.2	.04	----------	.32	.004
NIAGARA FALLS									
0	2,000	42	605	687.0	21.0	0.50	100.0+	3.5	0.083
2,001	4,000	139	3,870	1,670.0	58.0	.61	43.2	1.5	.016
4,001	8,000	137	6,960	2,340.0	67.0	.86	33.6	.96	.012
8,000	----------	47	28,400	2,440.0	76.0	.98	8.6	.27	.003
TOLEDO									
10	99	61	27	69.0	6.2	1.9	100.0+	23.0	7.0
100	999	162	193	71.0	10.0	2.6	36.8	5.2	1.3
1,000	9,999	116	2,240	283.0	26.0	3.8	12.4	1.1	.17
10,000	----------	26	11,500	402.0	32.0	3.9	3.5	.28	.034
YOUNGSTOWN									
100	999	7	100	2.3	0	0	2.3	0	0
1,000	9,999	117	1,000	7.1	.20	.08	.71	.020	.008
10,000	----------	242	10,000	5.4	.53	.04	.054	.0053	.0004

Although the relations between the bacterial quality of the several raw waters and that of the corresponding effluents were not as sharply defined in every instance as was true of the Ohio River plants, evidences of such correlation are to be found in each case. On the whole, a tendency was shown toward a greater constancy in the quality of effluents produced under varying conditions of raw-water pollution than was observed at the Ohio River plants, though it is also true that the quality of the raw water did not show, on the whole, as wide a range of fluctuation as did that of Ohio River water. With relatively small increases in the bacterial content of the various effluents, coincident with increases in the raw-water count, the percentages of residual bacteria tend to become diminished progressively as the numbers of bacteria in the raw waters increase. This tendency, which is clearly apparent in the percentage figures shown in the right-hand sections of Tables Nos. 63 and 64, is somewhat at variance with that of corresponding figures for the Ohio River plants (see Tables Nos. 41 and 42), which in the majority of cases displayed no marked trend to an orderly change with increasing numbers of raw-water bacteria. Aside from these differences, the correlations shown in Tables Nos. 63, 64, and 65 are similar in their characteristics to those previously given for the Ohio River plants.

Considering the relationships thus established for the various individual plants, marked divergences are indicated in the bacterial quality of effluents produced by them under parallel conditions with respect to raw-water pollution. As regards the relationships having reference to bacteria growing on plates at 20° C. and 37° C., these divergences probably are due not only to differences in the methods of treatment used at the several plants but also to variances in the physical character of the raw waters and to some extent in climatic conditions. As regards the *B. coli* relations, the two factors last named apparently are less significant, as was indicated by the observations made in connection with the study of Ohio River plants, and the disparities in quality of the effluents above noted are doubtless a truer index of the effects of variations in treatment methods thus employed. No hard and fast rule is here applicable, however, as in certain instances known conditions with respect to the physical character of the raw water were shown to affect the efficiency of *B. coli* removal in the same direction if not to the same extent as they do the removal of plate growing bacteria at both 20° C. and 37° C.

A good example of the exception noted is observed in the case of the Niagara Falls plant, treating the relatively clear water overflowing from the Great Lakes, but highly polluted bacterially by sewage from communities along the Niagara River. On referring to Tables Nos. 63, 64, and 65, it is apparent that the quality of effluents produced at each successive stage of purification, as measured either by the plate counts or by the *B. coli* index, is decidedly inferior under similar conditions of raw water than the quality of effluents produced at the same stages by certain other plants of the group, notably at Albany and Chester, where more highly turbid raw waters are treated. The comparatively low bacterial efficiency of the Niagara Falls plant without the aid of chlorination appears to be highly significant in relation to the difficulty of problems presented in the purification of water supplies derived from the Great Lakes.

Aside from the instance above cited, the mutual disparities in the bacterial efficiencies of the different plants as indicated by the comparative figures given in Tables Nos. 63, 64, and 65 bear an interesting relation, in a few cases, to the kind and elaboration of treatment used at the several plants. At Albany and Chester, for example, an extremely high bacterial efficiency is shown by the two plants treating exceptionally highly polluted raw waters. In the former instance, the original slow sand filter installation had been progressively elaborated up to the time of these observations by the addition of a coagulation system and of rapid sand roughing filters prior to slow sand filtration. In the latter case, the efficiency was aided by large settling basin capacity and by the use of relatively high amounts of chlorine.

The results obtained at the Elmira and New Milford plants reflect to a large extent the benefits secured by preliminary storage of the raw water prior to its delivery for treatment. The actual bacterial load on these plants is comparatively light, as shown by the low magnitudes of bacterial counts in the raw water in the upper ranges of their variation. At the Youngstown plant a remarkably high bacterial efficiency is shown by the preliminary stages of treatment, involving the softening of the water by lime and soda treatment in addition to its purification by conventional methods. In this instance the advantages of softening treatment from a standpoint of bacterial removal are strikingly indicated. Owing to the softening treatment, however, and to certain other physical conditions, notably the high temperature of the raw water, which are peculiar to the situation, the Youngstown plant presents a special case which hardly serves as a proper criterion for the expected performance of plants devoted exclusively to water purification.

Plots of the data given in Tables Nos. 63, 64, and 65 show that the relationships between the raw waters and effluents in respect to their bacterial quality are of the same general nature as those previously determined for the Ohio River plants, though in a few instances the relation is less orderly than for a majority of the Ohio River plants. The irregularities noted are difficult to explain satisfactorily, though doubtless they are due in part to factors concerned in the operation of individual plants or stages of treatment which are not common to Ohio River plants or to certain other plants of the group under discussion. It also should be noted in this connection that at the time of this survey the methods of laboratory control in use at plants of the latter group, which are more highly scattered geographically than are the Ohio River plants, had been developed with no previous opportunities for their mutual coordination, whereas laboratory methods at Ohio River plants already were fairly uniform, largely through the activities of the Ohio Conference on Water Purification and through other and more informal means of intercommunication between the various plant operators. Under these circumstances it is probable that the laboratory data secured from the more widely distributed group of plants elsewhere than on the Ohio River were less comparable with each other and subject to greater errors of interpretation than those obtained from the Ohio River plants. This doubtless was true, notwithstanding the efforts made by all of the operators to coordinate their laboratory procedures in connection with this survey, and it may be responsible in no small degree for the greater irregularity of the correlations derived from the data under discussion.

In spite of these irregularities, ample evidences are found in the data for every plant of a tendency for the relationship existing between the bacterial quality of the raw water and that of the effluents from various stages of treatment to be governed by the same type of equation as previously has been derived from the observations made at the Ohio River plants. This may be confirmed readily by plotting the data of Tables Nos. 63, 64, and 65 on logarithmic scales as previously shown in Parts I and II.

In this connection, it is of interest to note the general degree of correspondence between the relationships as derived from the data for the seven plants under discussion and as previously derived from the observations made at the Ohio River plants. In Table No. 66 is shown a comparison between the average numbers of *B. coli*, as observed in the unchlorinated and chlorinated effluents from each one of the seven plants during the period of observations, and the corresponding numbers as calculated from the correlation curves derived from combined observations made at the 10 Ohio River plants, basing the calculated figures, in each case, on the observed average numbers of *B. coli* in the raw water.

TABLE No. 66.—*Comparison between average numbers of B. coli as observed in unchlorinated and in chlorinated effluents from designated plants during the period of observations and corresponding numbers as calculated from observations at the Ohio River plants*[1]

Plant	B. coli index per 100 c. c.				
	Raw water	Unchlorinated filter effluent		Chlorinated filter effluent	
		Observed	Calculated[1]	Observed	Calculated[1]
Albany	19,400	2.2	8.0	0.2	1.3
Chester	20,500	5.1	8.0	.1	1.4
Elmira	580	.1	4.5	.2	.6
New Milford	180	1.5	3.4	.1	.5
Niagara Falls	8,290	59.0	6.6	1.0	1.1
Toledo	1,730	12.0	4.1	1.6	.8
Youngstown	6,930	.4	6.5	.1	1.1

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[1] Calculated figures based on values of *c* and *n* derived from combined data for the 10 Ohio River plants (Table No. 46).

On referring to the table, it is noted that the degree of concordance between the observed and the calculated figures is not high, though their divergence is not wide except in a few instances. It is noted, further, that the observed average numbers of *B. coli* in the unchlorinated effluent are lower than the calculated numbers in all except two cases and in the chlorinated effluent lower in all except one instance. With the exceptions thus noted, it appears, therefore, that the efficiency of *B. coli* removal of the seven individual plants was higher, under the respective average conditions of raw water pollution encountered during the year of observations, than would be indicated by the combined data from the Ohio River plants. Under these circumstances it would be expected that a majority of these plants could produce chlorinated effluents conforming to the revised Treasury Department *B. coli* standard from raw waters having a *B. coli* index not exceeding 5,000 per 100 cubic centimeters. From plots of the *B. coli* data from each individual plant, as given in Table No. 65, it readily can be shown that four of the seven plants could satisfy this specification by a considerable margin and that two of the remaining three plants could approximate it very closely.

As regards the production of unchlorinated effluents conforming to the Treasury Department standard, similar plots of the data have indicated that three of the seven plants, namely, those at Albany, Elmira, and Youngstown, on the basis of their performance during the period of observations could meet this requirement with a raw water *B. coli* index not exceeding 60 per 100 cubic centimeters. The remaining four plants could hardly be expected to do so as far as can be judged from their performance in this respect during the period in question.

Although, as previously pointed out, the seven plants under discussion were so widely separated geographically and so divergent from each other in respect to the conditions surrounding their operation that they can hardly be considered as a group in the same sense as applied to the Ohio River plants, it is of interest to compare the results obtained from a combination of the group averages for these plants with the corresponding results derived from a similar combination of the Ohio River data, which have been given in Tables Nos. 41, 42, and 43. In the present instance it is sufficient to show the results thus obtained only as expressed in terms of the *B. coli* index, which are readily derivable from the group averages for the individual plants which have previously been summarized in Table No. 65.

By thus combining the individual figures in the table falling within each indicated range of raw water *B. coli* results were obtained as given in Table No. 67. In Figure 47 these combined group averages[1] are shown graphically in relation to the corresponding lines drawn from values of *c* and *n* as derived from the combined observations from the 10 Ohio River plants (see Table No. 46). The comparison shown indicates that if the seven plants in question were to be considered as a single group their average efficiency in respect to *B. coli* removal would be of very nearly the same order of magnitude, under similar conditions of raw water pollution, as was shown by the Ohio River plants, taken as a single group. This doubtless is due, in part at least, to the fact that the divergence between the various individual plants in respect to the *B. coli* content of their effluents have a tendency to become mutually compensated when these figures are combined and averaged. On the other hand, the close accordance between these combined averages and those from the Ohio River plants, brought together in a similar manner, would suggest strongly that when the disparities as between the bacterial efficiencies of several individual plants are smoothed by a process of averaging, a decided tendency exists for their combined performance to approach a normal curve, such as those which are exemplified by the plots shown in Figure 47. At any event, two separate combinations of *B. coli* groupings, derived from observations made at two independent groups of plants, give almost identical relationship curves as between the *B. coli* content of the raw water and that of the unchlorinated and chlorinated effluents.

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[1] In combining the group averages for the unchlorinated filter effluent, the figures obtained from a single plant (Niagara Falls) were omitted owing to the fact that they were abnormally high and entirely out of harmony with those from the other plants.

TABLE No. 67.—*Relations between B. coli index of raw water and corresponding index of unchlorinated and chlorinated filter effluents, as derived from a combination of data for the seven individual plants given in Table No. 65*

Raw water B. coli index range	B. coli index per 100 c. c.		
	Raw water	Unchlorinated filter effluent [1]	Chlorinated filter effluent
100-999	225	3.5	0.48
1,000-9,999	1,810	6.0	.82
10,000-99,999	19,200	9.9	1.02

[1] Figures for Niagara Falls plant excluded from averages.

To sum up briefly this portion of the discussion, it may be stated that the evidence at hand indicates a reasonably close agreement exists as between the group relationships established for the 7 plants located elsewhere than on the Ohio River and for the 10 plants located along this stream. With the possible exception of two of the seven plants, both of which present some apparent abnormalities in their performance as compared with the remaining plants surveyed, it safely might be predicted on the basis of these observations that if the maximum *B. coli* index of the various raw waters were limited to 5,000 per 100 cubic centimeters, each plant of the group under discussion would be able to produce chlorinated effluents having an average *B. coli* content within the limit prescribed by the revised Treasury Department standard. The question as to the extent and the proportion of the time in which such effluents might be expected to fall below this standard can be considered only in the light of variations to be discussed in the section of the text which immediately follows.

Variations in the Quality of the Various Raw Waters and Effluents.

In Part II of this report the variations in the quality of the raw waters and effluents of Ohio River plants have been considered from two viewpoints, namely, their concurrent relations to each other and, secondly, their form and ranges in magnitude when studied individually. The text which follows will be concerned with the latter subject, as referred to the plants discussed in this section of the report.

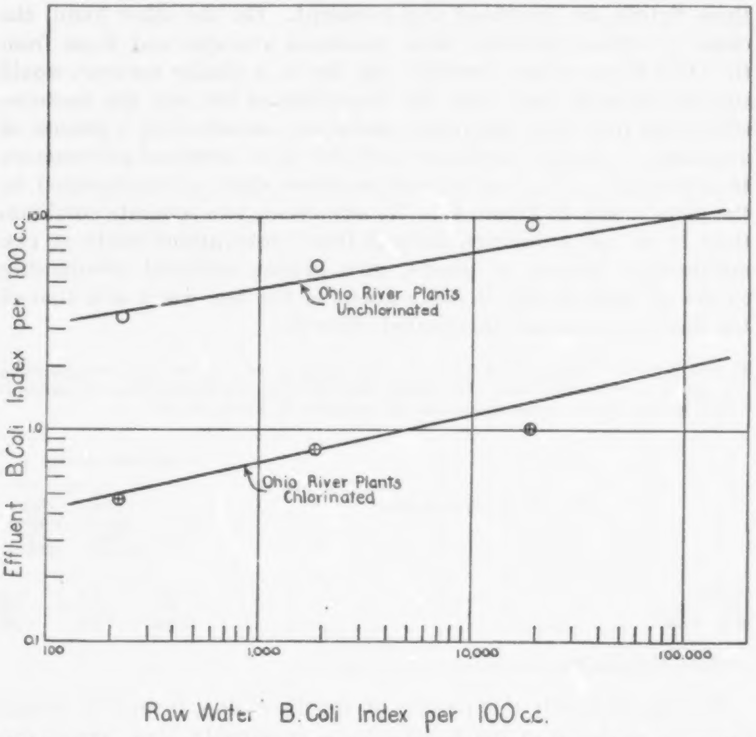

FIG. 47.—Plot of data given in Table No. 67, as shown in relation to lines drawn from corresponding combined data from the 10 Ohio River plants

In Table No. 68 are shown the frequencies with which the bacterial counts observed in each raw water and series of effluents fall within specified ranges of magnitude during the period of the study. The table is divided into three sections containing the percentages derived respectively from the 48-hour counts at 20° C., the 24-hour counts at 37° C., and the *B. coli* index figures. Inspection of these percentages indicates the frequency distributions to be similar in type to those previously derived from results obtained at the Ohio River plants.

TABLE No. 68.—*Percentages of total samples giving bacterial counts falling within specified ranges*

A. 48-HOUR AGAR COUNT, 20° C.

RAW WATER

Plant	Bacterial count per c. c., ranging from—										
	0-100	101-200	201-400	401-800	801-1,600	1,301-3,200	3,201-6,400	6,401-12,800	12,801-25,600	25,601-51,200	Over 51,200
Albany, N. Y.	------	------	------	0.3	5.7	10.4	21.6	26.8	21.8	9.6	3.8
Elmira, N. Y.	------	------	------	.9	10.5	23.0	20.8	21.4	15.4	7.1	.9
New Milford, N. J.	3.9	8.8	14.1	35.6	20.3	11.0	4.0	2.3	------	------	------
Niagara Falls, N. Y.	------	------	------	------	------	------	6.6	82.5	10.1	.8	------
Toledo, Ohio	.5	3.8	13.4	22.4	12.1	11.5	7.4	6.8	5.7	8.7	7.7
Youngstown, Ohio	.8	.5	3.6	9.0	11.2	17.2	17.0	20.8	14.2	5.2	.5

PRIMARY SETTLED WATER

Plant	Bacterial count per c. c., ranging from—								
	0-50	51-100	101-200	201-400	401-800	801-1,600	1,601-3,200	3,201-6,400	Over 6,400
New Milford, N. J.	------	0.3	4.1	34.7	48.3	9.1	1.6	1.1	0.8

APPLIED TO FILTERS

Plant	Bacterial count per c. c., ranging from—									
	0-25	26-50	51-100	101-200	201-400	401-800	801-1,600	1,601-3,200	3,201-6,400	Over 6,400
Albany, N. Y.	------	------	------	2.2	5.2	10.9	26.2	27.9	15.6	12.0
Niagara Falls, N. Y.	------	------	------	------	------	------	.5	23.4	59.4	16.7
Toledo, Ohio	0.8	4.9	12.6	23.3	17.2	10.9	7.4	7.9	7.1	7.9
Youngstown, Ohio	78.7	7.1	8.7	4.4	1.1	------	------	------	------	------

FILTERED—UNCHLORINATED

Plant	Bacterial count per c. c., ranging from—									
	0-1	2-4	5-8	9-16	17-32	33-64	65-128	129-256	257-512	Ove 51
Albany, N. Y.	------	4.1	10.1	14.5	17.2	12.5	15.1	6.8	7.4	1.2
Elmira, N. Y.	13.6	36.9	25.9	15.3	5.1	2.6	.6	------	------	------
Niagara Falls, N. Y.	------	------	------	------	------	------	------	------	2.2	97.8
Toledo, Ohio	------	1.1	3.3	7.9	16.7	23.7	10.9	9.6	6.6	20.2
Youngstown, Ohio	78.4	12.8	4.9	1.9	1.4	.3	.3	------	------	------

FILTERED—CHLORINATED

Albany, N. Y.	4.1	38.2	21.1	13.7	15.9	4.6	1.6	0.8	------	------
Elmira, N. Y.	.6	13.2	30.5	31.5	15.7	7.2	1.3	------	------	------
New Milford, N. J.	------	3.0	21.3	30.9	29.5	13.7	1.6	------	------	------
Niagara Falls, N. Y.	------	5.2	32.9	35.9	18.9	6.3	.8	------	------	------
Toledo, Ohio	4.7	16.1	10.4	10.9	18.3	17.5	11.7	5.2	3.0	2.2
Youngstown, Ohio	73.0	13.4	7.4	2.7	.8	1.6	.3	.8	------	------

Table No. 68.—*Percentages of total samples giving bacterial counts falling within specified ranges*—Continued

B. (24-HOUR AGAR COUNT, 37° C.)

RAW WATER

Plant	Bacterial count per c. c., ranging from—								
	0-100	101-200	201-400	401-800	801-1,600	1,601-3,200	3,201-6,400	6,401-12,800	Over 12,800
Albany, N. Y.	2.5	3.3	10.4	19.9	22.6	18.0	13.7	7.1	2.5
Chester, Pa.	1.2	.8	.4	9.7	15.8	23.5	24.7	16.2	7.7
New Milford, N. J.	20.1	21.2	28.0	17.8	7.5	3.7	1.4	.3	------
Toledo, Ohio	12.3	19.7	23.8	15.8	10.9	9.8	5.5	1.9	.3
Youngstown, Ohio	2.7	3.3	7.4	17.5	18.1	17.0	13.2	8.5	12.3

PRIMARY SETTLED WATER

Plant	Bacterial count per c. c., ranging from—								
	0-50	51-100	101-200	201-400	401-800	801-1,600	1,601-3,200	3,201-6,400	Over 6,400
New Milford, N. J.	5.2	14.3	31.7	26.3	15.1	4.7	1.1	0.8	0.8

APPLIED TO FILTERS

Plant	Bacterial count per c. c., ranging from—								
	0-25	26-50	51-100	101-200	201-400	401-800	801-1,600	1,601-3,200	Over 3,200
Albany, N. Y.	1.6	8.2	13.9	20.5	23.3	12.0	7.1	8.2	5.2
Chester, Pa.	------	6.1	17.8	27.2	19.0	13.4	8.7	6.1	1.7
Toledo, Ohio	16.1	28.1	27.0	17.5	6.6	4.4	.3	------	------
Youngstown, Ohio	81.1	9.9	5.5	1.1	.5	.5	.3	1.1	------

FILTERED—UNCHLORINATED

Plant	Bacterial count per c. c., ranging from—									
	0-1	2-4	5-8	9-16	17-32	33-64	65-128	129-256	257-512	Over 512
Albany, N. Y.	3.3	20.8	25.4	20.0	10.9	4.6	6.3	6.3	1.6	0.8
Chester, Pa.	17.7	22.1	12.4	11.9	7.1	8.0	8.0	6.6	2.7	3.5
New Milford, N. J.	------	.6	2.3	11.5	28.2	33.5	19.7	3.9	.3	0
Toledo, Ohio	1.4	22.6	21.8	19.7	16.4	9.1	7.4	1.6	------	------
Youngstown, Ohio	76.8	15.9	4.1	.5	1.4	.3	.5	------	.5	------

FILTERED—CHLORINATED

Albany, N. Y.	10.9	45.4	32.0	10.1	1.1	0.5	------	------	------	------
Chester, Pa.	75.6	17.5	4.5	1.2	.8	.4	------	------	------	------
New Milford, N. J.	1.6	9.6	17.0	27.7	24.4	15.1	4.1	0.5	------	------
Toledo, Ohio	6.6	31.7	18.9	18.6	13.9	7.9	1.6	.8	------	------
Youngstown, Ohio	70.9	16.9	5.5	3.6	1.4	.3	.8	.1	0.5	------

TABLE No. 68.—*Percentages of total samples giving bacterial counts falling within specified ranges*—Continued

C—B. COLI INDEX

RAW WATER

Plant	Total samples tested	Number of samples giving index of—					Per cent of samples giving index of—				
		10	100	1,000	10,000	100,000	10	100	1,000	10,000	100,000
Albany	982	------	366	360	219	37	------	37.3	36.6	22.3	3.8
Chester	290	------	7	150	133	0	------	2.4	51.7	45.9	0
Niagara Falls	364	------	35	303	26	------	------	9.6	83.3	7.1	------
Toledo	700	------	428	211	60	1	------	61.1	30.2	8.6	.1
Youngstown	970	------	366	360	244	0	------	37.7	37.1	25.2	0

APPLIED TO FILTERS

Plant	Total samples tested	10	100	1,000	10,000	100,000	10	100	1,000	10,000	100,000
Albany	918	366	349	191	12	0	39.9	38.0	20.8	1.3	0
Chester	524	0	313	211	0	0	0	59.7	40.3	0	0
Niagara Falls	363	0	233	130	0	0	0	64.2	35.8	0	0
Toledo	625	364	211	50	0	0	58.2	33.8	8.0	0	0
Youngstown	74	60	14	0	0	0	81.1	18.9	0	0	0

FILTERED—UNCHLORINATED

Plant	Total samples tested	Number of samples giving index of—						Per cent of samples giving index of—					
		0	2	4	6	8	10	0	2	4	6	8	10
Albany	366	257	------	------	------	------	109	70.2	------	------	------	------	29.8
Chester	241	58	31	26	23	47	56	24.0	12.9	10.8	9.6	19.5	23.2
Niagara Falls	364	1	94	0	171	0	98	.3	25.8	0	46.9	0	27.0
Toledo	533	230	0	0	0	0	303	43.0	0	0	0	0	57.0
Youngstown	367	355	10	0	0	0	2	96.8	2.7	0	0	0	.5

FILTERED—CHLORINATED

Plant	Total samples tested	0	2	4	6	8	10	0	2	4	6	8	10
Albany	366	330	32	4	------	------	------	90.1	8.8	1.1	------	------	------
Chester	302	297	3	1	0	0	1	98.5	.9	.3	0	0	.3
Niagara Falls	364	271	75	13	5	0	0	74.5	20.6	3.5	1.4	0	0
Toledo	363	148	63	67	25	25	35	40.6	17.4	18.5	6.9	6.9	9.7
Youngstown	366	364	0	0	0	0	2	99.5	0	0	0	0	.5

In Table No. 69 are tabulated the percentages of frequency with which the numbers of bacteria and of *B. coli* exceeded the upper limits of ranges given in the respective sections of Table No. 68.

TABLE NO. 69.—*Percentages of samples giving bacterial counts higher than specified numbers*

A.—48-HOUR AGAR COUNT, 20° C.

RAW WATER

Plant	Bacterial count per cubic centimeter										
	0	100	200	400	800	1,600	3, 200	6,400	12,800	25,600	51,200
Albany, N. Y	------	------	------	100.0	99.7	94.0	83.6	62.0	35.2	13.4	3.8
Elmira, N. Y	------	------	------	100.0	99.1	88.6	65.6	44.8	23.4	8.0	.9
New Milford, N. J	100	96.1	87.3	73.2	37.6	17.3	6.3	2.3	------	------	------
Niagara Falls, N. Y	------	------	------	------	------	------	100.0	93.4	10.9	.8	------
Toledo, Ohio	100	99.5	95.7	82.3	59.9	47.8	36.3	28.9	22.1	16.4	7.7
Youngstown, Ohio	100	99.2	98.7	95.1	86.1	74.9	57.7	40.7	19.9	5.7	.5

Table No. 69.—*Percentages of samples giving bacterial counts higher than specified numbers*—Continued

A.—48-HOUR AGAR COUNT, 20° C—Continued

PRIMARY SETTLED WATER

Plant	Bacterial count per cubic centimeter								
	0	50	100	200	400	800	1,600	3,200	6,400
New Milford, N. J		100	99.7	95.6	60.9	12.6	3.5	1.9	0.8

APPLIED TO FILTERS

Plant	Bacterial count per cubic centimeter									
	0	25	50	100	200	400	800	1,600	3,200	6,400
Albany, N. Y				100.0	97.8	92.6	81.7	55.5	27.6	12.0
Niagara Falls, N. Y							100.0	99.5	76.1	16.7
Toledo, Ohio	100	99.2	94.3	81.7	58.4	41.2	30.3	22.9	15.0	7.9
Youngstown, Ohio	100	21.3	14.2	5.5	1.1					

FILTERED—UNCHLORINATED

Plant	Bacterial count per cubic centimeter									
	0	2	4	8	16	32	64	128	256	512
Albany, N. Y		100.0	95.9	85.8	71.3	54.1	41.6	26.5	19.7	12.5
Elmira, N. Y	100	86.4	49.5	23.6	8.3	3.2	.6			
Niagara Falls, N. Y									100.0	97.8
Toledo, Ohio		100.0	98.9	95.6	87.7	71.0	47.3	36.4	26.8	20.2
Youngstown, Ohio	100	21.6	8.8	3.9	2.0	.6	.3			

FILTERED—CHLORINATED

Albany, N. Y	100	95.9	57.7	36.6	22.9	7.0	2.4	0.8		
Elmira, N. Y	100	99.4	86.2	55.7	24.2	8.5	1.3			
New Milford, N. J		100.0	97.0	75.7	44.8	15.3	1.6			
Niagara Falls, N. Y		100.0	94.8	61.9	26.0	7.1	.3			
Toledo, Ohio	100	95.3	79.2	68.8	57.9	39.6	22.1	10.4	5.2	2.2
Youngstown, Ohio	100	27.0	13.6	6.2	3.5	2.7	1.1	.8		

B.—24-HOUR AGAR COUNT, 37° C.

RAW WATER

Plant	Bacterial count per cubic centimeter								
	0	100	200	400	800	1,600	3,200	6,400	12,800
Albany, N. Y	100	97.5	94.2	83.8	63.9	41.3	23.3	9.6	2.5
Chester, Pa	100	98.8	98.0	97.6	87.9	72.1	48.6	23.9	7.7
New Milford, N. J	100	79.9	58.7	30.7	12.9	5.4	1.7	.3	
Toledo, Ohio	100	87.7	68.0	44.2	28.4	17.5	7.7	2.2	.3
Youngstown, Ohio	100	97.3	94.0	86.6	69.1	51.0	34.0	20.8	12.3

Table No. 69.—*Percentages of samples giving bacterial counts higher than specified numbers*—Continued

B.—24-HOUR AGAR COUNT, 37° C—Continued

PRIMARY SETTLED WATER

Plant	Bacterial count per cubic centimeter								
	0	50	100	200	400	800	1,600	3,200	6,400
New Milford, N. J.	100	94.8	80.5	48.8	22.5	7.4	2.7	1.6	.8

APPLIED TO FILTERS

Plant	Bacterial count per cubic centimeter								
	0	25	50	100	200	400	800	1,600	3,200
Albany, N. Y.	100	98.4	90.2	76.3	55.8	32.5	20.5	13.4	5.2
Chester, Pa.		100	93.9	76.1	48.9	29.9	16.5	7.8	1.7
Toledo, Ohio	100	83.9	55.8	28.8	11.3	4.7	.3		
Youngstown, Ohio	100	18.9	9.0	3.5	2.4	1.9	1.4	1.1	

FILTERED—UNCHLORINATED

Plant	Bacterial count per cubic centimeter									
	0	2	4	8	16	32	64	128	256	512
Albany, N. Y.	100	96.7	75.9	50.5	30.5	19.6	15.0	8.7	2.4	0.8
Chester, Pa.	100	82.3	60.2	47.8	35.9	28.8	20.8	12.8	6.2	3.5
New Milford, N. J.		100	99.4	97.1	85.6	57.4	23.9	4.2	.3	
Toledo, Ohio	100	98.6	76.0	54.2	34.5	18.1	9.0	1.6		
Youngstown, Ohio	100	23.2	7.3	3.2	2.7	1.3	1.0		.5	

FILTERED—CHLORINATED

Albany, N. Y.	100	89.1	43.7	11.7	1.6	0.5				
Chester, Pa.	100	21.4	6.9	2.4	1.2	.4				
New Milford, N. J.	100	98.4	88.8	71.8	44.1	19.7	4.6	0.5		
Toledo, Ohio	100	93.4	61.7	42.8	24.2	10.3	2.4	.8		
Youngstown, Ohio	100	29.1	12.2	6.7	3.1	1.7	1.4	.6	0.5	

C.—B. COLI INDEX

RAW WATER

Plant	Total samples tested	Per cent giving B. coli index equal to or exceeding—				
		10	100	1,000	10,000	100,000
Albany	982		100	62.7	26.1	3.8
Chester	290		100	97.6	45.9	0
Niagara Falls	364		100	90.4	7.1	0
Toledo	700		100	38.9	8.7	.1
Youngstown	970		100	62.3	25.1	0

APPLIED TO FILTERS

Albany	918	100	60.1	22.1	1.3	0
Chester	524		100.0	40.3	0	0
Niagara Falls	363		100.0	35.8	0	0
Toledo	625	100	41.8	.8	0	0
Youngstown	74	100	18.9	0	0	0

Table No. 69.—*Percentages of samples giving bacterial counts higher than specified numbers*—Continued

C.—B. COLI INDEX—Continued

FILTERED—UNCHLORINATED

Plant	Total samples tested	Per cent giving B. coli index equal to or exceeding—				
		2	4	6	8	10
Albany	366	29.3	29.8	29.8	29.8	29.8
Chester	238	76.0	63.1	52.3	42.7	23.2
Niagara Falls	364	99.7	73.9	73.9	27.0	27.0
Toledo	533	57.0	57.0	57.0	57.0	57.0
Youngstown	367	3.2	.5	.5	.5	.5

FILTERED—CHLORINATED

Plant	Total samples tested	2	4	6	8	10
Albany	366	9.9	1.1	0	0	0
Chester	302	1.5	.6	0	0	.3
Niagara Falls	364	25.5	4.9	1.4	0	0
Toledo	363	59.4	42.0	23.5	16.6	9.7
Youngstown	366	0	0	0	0	.5

From Table No. 69 three charts, Figures 48, 49, and 50, have been drawn on logarithmic "probability" scales, showing graphically the frequencies with which the numbers of bacteria observed in the raw waters and chlorinated filter effluents exceeded various amounts. The frequency curves for intermediate stages of treatment have been omitted for the sake of economy of space. It is noted that with few exceptions the plots have a decided straight-line trend, with a tendency toward mutual parallelism, these characteristics being especially striking in the chart derived from the counts at 37° C.

In the frequency plot of *B. coli* data given in Figure 51, no graphs of the results obtained from the Elmira and New Milford plants are included, as the system of dilutions used in *B. coli* tests at these two plants was not such as to permit the expression of their results in the form of frequency distributions comparable with those secured from the other plants. In addition. plots of the data for the chlorinated filter effluents of the Chester and Youngstown plants have been omitted because an insufficient number of positive results were obtained in these two instances to form well-marked frequency distributions. (See Tables Nos. 68 and 69.) The graphs derived from the raw water data are somewhat unsatisfactory owing to the relatively wide plotting intervals afforded by the results obtained from tests made with the decimal system of dilutions.

From the plots shown in Figure 51, the percentages of frequency with which the *B. coli* index of the various raw waters exceeded their means for the period of observations may be roughly estimated by interpolating in the chart the percentage figure corresponding to the mean in question in each case. Thus, the mean raw water index for the Albany plant was 19,400 per 100 cubic centimeters, and the corresponding percentage interpolated from the line for this plant was approximately 16 per cent. In a similar manner, the following frequencies of *B. coli* indices in excess of the mean are obtained:

Plant	Mean B. coli index, raw water	Per cent frequency in excess of mean
Albany	19, 400	16
Chester	20, 500	20
Niagara Falls	8, 290	10
Toledo	1, 730	30
Youngstown	6, 930	30
Average		21

In general, the higher the percentages of frequency in excess of the mean the less is the mean influenced by a few extremely high results, and the greater is the relative uniformity of the distribution around the mean. The figures given do not vary, however, over wide limits, the lowest being 10 per cent and the highest 30, with an average of 21 per cent. In Table No. 55, given in connection with Part II, are percentages of excess over the mean derived in a similar manner for the Ohio River plants. It is noted that the average in this instance was 29 per cent, which is not widely different from the corresponding figure above stated.

It is of interest in this connection to note the percentages of frequency with which the *B. coli* content of the various raw waters exceeded the limit, 5,000 per 100 cubic centimeters, determined from the study of Ohio River plants as being the maximum consistent with the production of chlorinated effluents conforming to the Treasury Department standard. By the same procedure as followed in deriving the figures in Table No. 56, Part II, the following results have been obtained:

Plant	Mean B. coli index, raw water	Per cent frequency in excess of 5,000 B. coli
Albany	19, 400	36
Chester	20, 500	70
Niagara Falls	8, 290	28
Toledo	1, 730	16
Youngstown	6, 930	34

As was found in the case of the Ohio River plants (see pp. 165–166), a fair degree of correlation is shown between these mean *B. coli* indices and the percentages of frequency with which the index exceeded 5,000 per 100 cubic centimeters. In Figure 51, points representing the plotted values for the five plants in question, as given in the above tabulation, are shown in relation to the curve derived from similar figures for the Ohio River plants and reproduced from Figure 42. It is noted that the points for all except the Chester plant lie reasonably close to the curve, the single exception noted being an apparently abnormal case similar to that of the Ironton plant which was noted in connection with Table No. 55. The fairly close correspondence between the plotted points for four of the plants with the curve obtained from the Ohio River plants indicates that for purposes of rough estimate the percentages of frequency with

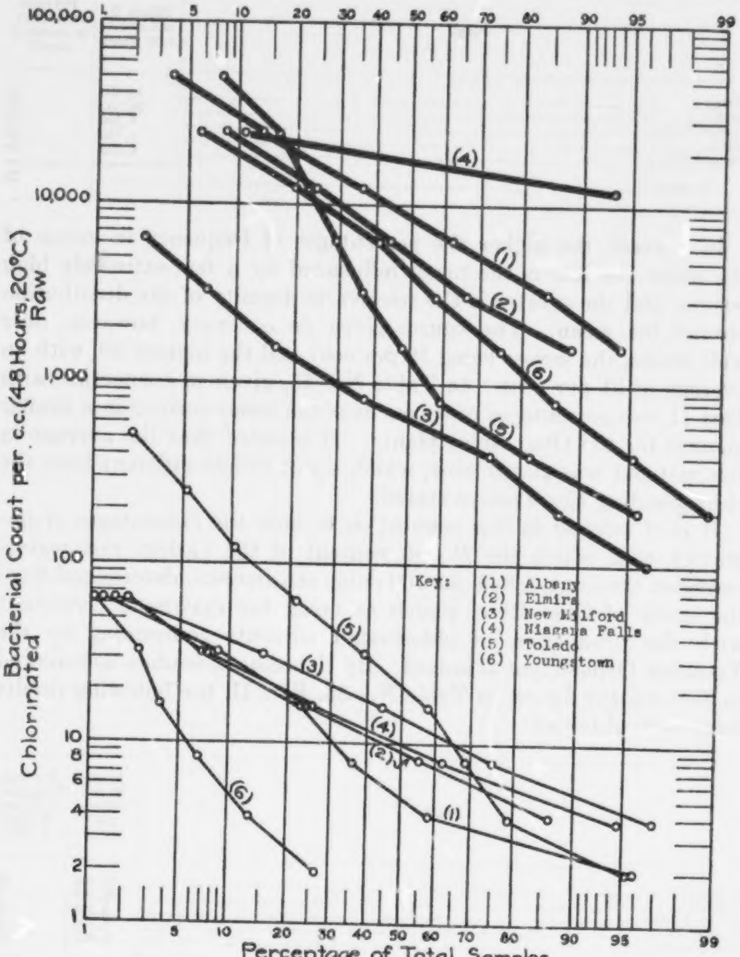

FIG. 48.—Logarithmic probability plot showing the frequencies with which the bacterial count (48 hours at 20° C.), as observed in the raw waters and final chlorinated effluents of designated plants, equaled or exceeded various amounts

which the *B. coli* index of the various raw waters might be expected to exceed 5,000 per 100 cubic centimeters in a given year may be determined for any given average condition of raw water pollution as indicated by the yearly mean *B. coli* index. The same principle would apply to any limiting index other than the one selected, which has been used merely for purposes of illustration.

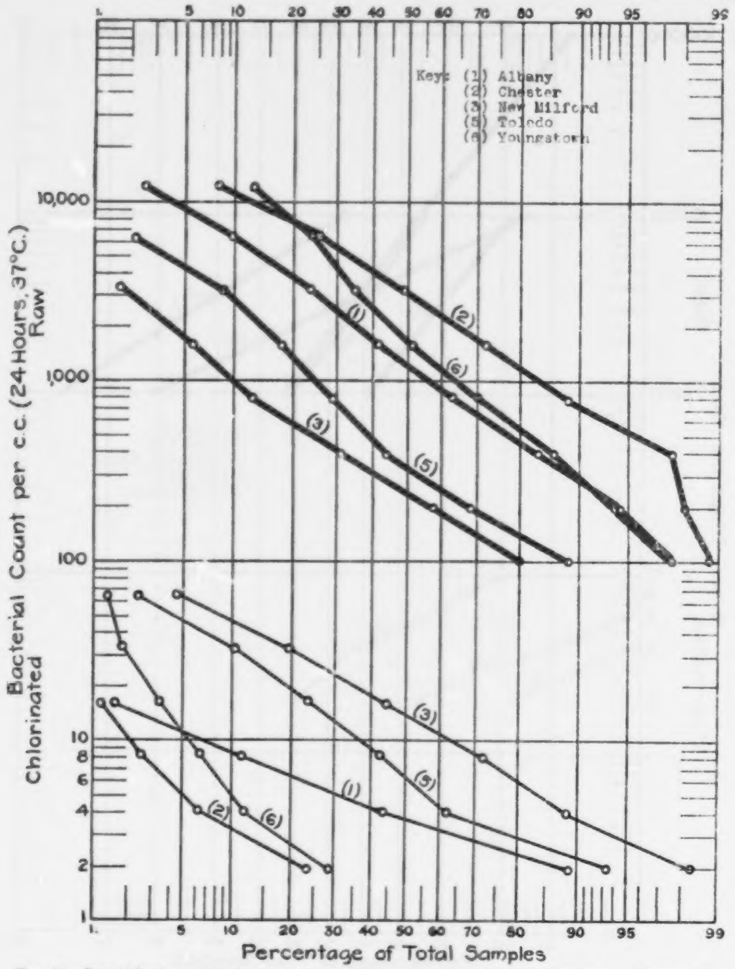

FIG. 49.—Logarithmic probability plot showing the frequencies with which the bacterial count (24 hours at 37° C.), as observed in the raw waters and final chlorinated effluents of designated plants, equaled or exceeded various amounts

Summary of Part III.

The results obtained from the survey of the seven plants as described in this section of the report have confirmed in general those secured from the study of the Ohio River plants, making due allowance for the considerable deviations from the average observed in individual cases, which are to be expected in view of the wide diversity of conditions represented in the group of plants surveyed.

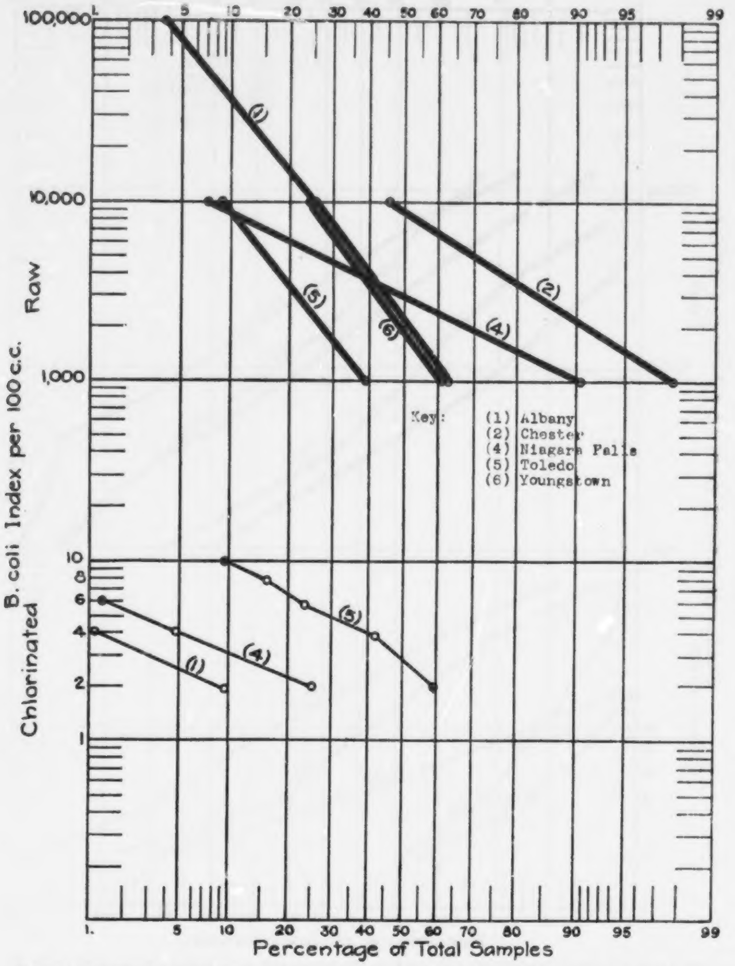

FIG. 50.—Logarithmic probability plot showing the frequencies with which the *B. coli* index, as observed in the raw waters and final chlorinated effluents of designated plants, equaled or exceeded various amounts

With two exceptions, the raw water supplies of the plants under observation were highly polluted bacterially as delivered for treatment, the exceptions being examples of the advantages securable by preliminary storage of water from a polluted source prior to its treatment by conventional water purification methods. In four instances the yearly average *B. coli* content of the raw waters observed was higher than the limit, 5,000 per 100 cubic centimeters, determined from the Ohio River plant survey as the maximum consistent with the production of chlorinated effluents conforming to the Treasury Department standard. In two of the four instances (Albany and Chester) the degree of raw water pollution was higher in respect to *B. coli* content than that of any other of the plants surveyed, either on the Ohio River or elsewhere.

The efficiencies of bacterial removal observed at the several plants were found to be of about the same order of magnitude, at corresponding stages of treatment, as were observed at the Ohio River plants. The average indicated efficiency of *B. coli* removal by all of the seven plants exceeded 99 per cent without the aid of chlorination and exceeded 99.9 per cent with chlorination. On the basis of average bacterial counts at 37° C., the average efficiency of bacterial removal without chlorination approximated 98 per cent and with chlorination exceeded 99 per cent in all except one instance.

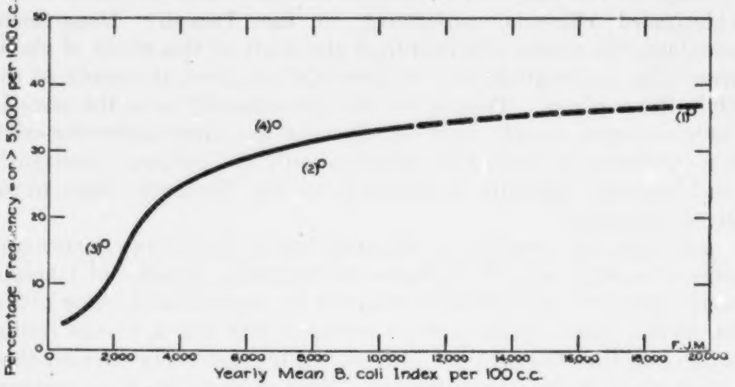

FIG. 51.—Relation between the yearly mean *B. coli* index, as observed in the raw waters of four designated plants, and the frequencies with which the index equaled or exceeded 5,000 *B. coli* per 100 c. c.; shown in relation to the curve derived from corresponding data from the 10 Ohio River plants, as replotted from Figure 42. Key to plotted points: (1) Albany, (2) Niagara Falls, (3) Toledo, (4) Youngstown

The observations made concerning the effects of variations in seasonal conditions and in raw water turbidity on the efficiencies of bacterial removal were of interest in connection with similar observations made at the Ohio River plants. Both of these factors were found to exert a measurable influence on the bacterial efficiency when measured in terms of the plate count, but were indicated as affecting to a very slight, if any, extent the efficiency of *B. coli* removal. In this and other respects the observations obtained from this group of plants gave indications parallel with those secured from the Ohio River plants.

The correlations made as between the bacterial quality of the various raw waters and the corresponding quality of the filter effluents, both unchlorinated and chlorinated, produced by the several plants of the group showed the existence of a relationship similar in every respect to that which was observed at the Ohio River plants. A study of this relationship, as applied to the *B. coli* data, has indicated that all of the seven plants, with one possible exception, could produce consistently chlorinated effluents conforming to the Treasury Department standard from raw waters having an average *B. coli* index not greater than 5,000 per 100 cubic centimeters.

As regards the determination of the maximum limit of *B. coli* density in the raw water consistent with the production of unchlorinated effluents conforming to the Treasury Department standard, the results obtained from the study of this group of plants were fully as unsatisfactory as those derived from the study of the Ohio River plants. The reasons for this difficulty were the same in both instances, namely, that a majority of the plants under the existing conditions of raw water pollution could not produce consistently unchlorinated effluents conforming to the Treasury Department *B. coli* standard.

Although the presence of industrial wastes in the raw water supplies of certain individual plants of the group, notably at Chester, were known to cause complications in the operation of these plants at certain times, little positive evidence was found in the results indicating that the presence of these wastes materially affected their efficiency of bacterial purification. This observation is at variance with that made in the case of the Ohio River plants, in which it was indicated that the bacterial efficiencies of two of the plants (East Liverpool and Steubenville) is adversely influenced by conditions in the upper stretch of the Ohio River which appear to be intimately associated with the presence of considerable amounts of industrial wastes. Two plants of the group (Toledo and Niagara Falls) displayed markedly lower efficiencies of bacterial removal than other plants of the group. In the latter instance, doubtless the physical and probably also the chemical character of the raw water is responsible to a large extent for the low efficiencies noted. In the former case, however, no clear explanation of the difference is at hand.

Concluding Discussion.

The studies of the efficiency of municipal water purification plants described in this report have provided a basis for some tentative conclusions which, though subject to probable revision in certain respects after further studies of the subject have been completed, are sufficiently definite to serve as a base line for such further studies. The conclusions of more general significance may be stated as follows:

1. Under normal conditions of their operation, all of the plant studies have shown a fairly definite relationship as existing between variations in the bacterial quality of their raw water supplies and concurrent variations in the quality of effluents produced by them at successive stages of treatment.

2. In general, the nature of this relationship has been found to be expressed by the equation: $E=cR^n$, in which R represents the bacterial density of the raw, or influent water, E, that of the effluent water and c and n, empirical constants.

3. The over-all efficiency of bacterial purification, when expressed in terms of *B. coli* removal, appears to be influenced to a relatively slight, if any, extent by changes in temperature and other seasonal conditions, or by variations in raw water turbidity. It is affected, however, by the density of bacteria in the raw water, being increased with greater densities, though in diminishing proportions as the higher ranges of density are approached.

4. According to the best statistical evidence afforded by these surveys, the maximum degree of raw water pollution, as measured in terms of the *B. coli* index, consistent with the production of *chlorinated* effluents conforming to the revised Treasury Department standard, is represented by a *B. coli* index approximating 5,000 per 100 cubic centimeters. The corresponding maximum raw water index consistent with producing *unchlorinated* effluents meeting the same standard appears to approximate 60 per 100 cubic centimeters, though the evidence at hand is less satisfactory on this point.

The raw water maxima stated in conclusion (4) represent, in each instance, a mean condition, defining the limiting degree of raw water pollution which the average plant of the type studied might be expected to tolerate, consistent with attaining the objective stated, under normal circumstances. Some individual plants, particularly those containing highly elaborated features, such as double-stage sedimentation or double filtration, would be expected, on the basis of these observations, to purify successfully raw waters more highly polluted than above indicated. Others, less highly elaborated or skillfully operated, might be unable to meet the raw water condition.

From the above and other considerations, it appears that observational maxima, such as those given in conclusion (4), hardly can be regarded as affording a proper working criterion of raw water pollution without some degree of modification, so designed as to provide a definite factor of safety to cover individual variations in bacterial efficiency. Some authorities have held that the post-filter chlorination stage of water filtration processes should be held as such a safety factor. Others have maintained that to do so would entail a failure to utilize to the fullest extent the economical advantages of chlorination. A compromise between these two views, suggested[2] from results obtained from these studies, would involve assigning a definite factor of safety such that the average *B. coli* content of the final chlorinated effluent would be not greater than some fraction of the limit imposed by the Treasury Department standard. For example, if the factor were three, the required *average B. coli* index of the chlorinated effluent would be not greater than 0.33 per 100 cubic centimeters. By means of relationships, such as are shown in the various tables and charts accompanying this report, it would be a very simple matter to calculate, directly or indirectly, the limiting numbers of raw water *B. coli* consistent with producing effluents satisfying the condition stated. Such a calculation may well be deferred, however, until further studies of this problem, especially the experimental studies now in progress, have been completed and their results fully analyzed. In the meantime, a method of approach to a calculation of this kind has been suggested in the paper[3] to which reference has been made.

Aside from furnishing the general conclusions above stated, these studies have indicated that water purification plants operating along the Ohio River are unable, under existing conditions of pollution of this stream, to produce unchlorinated effluents conforming, as an average, to the revised Treasury Department standard, though it appears, from the evidence of the survey, that by the continuous and effective use of chlorine they can produce, for a large proportion of the time, chlorinated effluents meeting this standard. On the basis of the average observed limit of tolerance in respect to *B. coli* content, two of the plants, located, respectively, at Ashland, Ky., and Ironton, Ohio, were clearly indicated as being overburdened under present conditions.

The results secured from the group of seven plants located elsewhere than on the Ohio River, which have been described in Part III of the report, confirmed in a general way those obtained from the two series of observations of the Ohio River plants. It thus was indicated that, with one exception, all of the seven plants could produce consistently chlorinated effluents conforming to the revised Treasury Department standard from raw waters containing not more than approximately 5,000 *B. coli* per 100 cubic centimeters, as expressed in terms of the *B. coli* index. But three of the seven plants, however, were indicated as being able to produce unchlorinated effluents meeting the same standard from raw waters containing 60 or more *B. coli* per 100 cubic centimeters. Two plants of this group, located, respectively, at Albany, N. Y., and Chester, Pa., were shown to be grossly overburdened by raw-water pollution, as judged by the average tolerance limit above noted.

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[2] Appendix to Report of Committee on Chlorination, Conference of State Sanitary Engineers, 1926. Reprinted in The American City, Vol. 35, No. 6, December, 1926, pp. 788-791.

[3] Loc. cit., p. 228.

A detailed analysis of the frequencies with which the bacterial content of the various raw waters and effluents equaled or exceeded specified limits during the period of the observations furnished a basis for estimating the effects which a given degree of change in the average quality of these waters, either in the direction of improvement or in one of deterioration, might be expected to have on the frequency with which the quality may become deteriorated below any particular limit. The results obtained from this analysis have been designed to lay the groundwork for a later discussion of average working standards of raw-water pollution in relation to the question of frequencies of deterioration below such standards. Incidentally, however, these data have shown some interesting and instructive parallelisms in respect to the direction and extent of the variations in quality displayed by the several raw waters and effluents.

No final conclusions, other than those above stated, can be reached from the surveys described in this report until the results obtained from them have been checked carefully against the results of experimental studies of the same question which at this writing are in progress at the Laboratory of Stream Pollution Investigations at Cincinnati, Ohio, though preliminary indications of these experimental studies tend to confirm, in every major respect, the conclusions reached tentatively from the results obtained from the survey. In this connection, however, it should be emphasized that in any final determination of working limits of bacterial pollution of raw-water supplies taken from streams for purification, full account should be taken of the comparatively limited scope of the observations which it thus far has been practicable to make on the performance of municipal plants; likewise of the necessity of applying an adequate factor of safety for purposes of administrative control. It furthermore should be pointed out that systematic and well-correlated observations of full-scale plant performance have thus far included no examples of plants to be found west of the Mississippi River and but one example of plants treating water from the Great Lakes. It is highly desirable that the surveys described in this report be extended, ultimately, to embrace a suitable number of municipal plants located in both of the two general areas mentioned.

APPENDIXES

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APPENDIX A

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923–24

EAST LIVERPOOL (OHIO) WATER FILTRATION PLANT

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
July, 1923	*1,000 gallons*	*° C.*																				
1	3,766	23.5	25	------	10	11	13	------	------	------	------	------	17,000	------	1,600	340	1	100	------	100	0	0
2	4,214	23.5	25	------	10	11	13	------	------	------	------	------	10,000	------	2,400	650	3	10	------	100	0	0
3	3,712	24	20	------	12	17	18	------	------	------	------	------	6,000	------	1,020	320	3	100	------	100	6	0
4	3,440	24	10	------	8	14	16	------	------	------	------	------	18,000	------	150	180	2	100	------	100	2	0
5	3,614	24	15	------	8	15	20	------	------	------	------	------	2,500	------	380	22	1	10	------	10	0	0
6	3,958	24.5	15	------	8	19	24	------	------	------	------	------	2,200	------	750	80	0	0	------	100	2	0
7	3,646	24.5	15	------	8	15	23	------	------	------	------	------	1,700	------	950	380	1	0	------	10	6	9
8	3,664	24.5	15	------	8	15	21	------	------	------	------	------	6,200	------	1,000	100	1	0	------	0	3	0
9	3,330	24.5	15	------	8	20	23	------	------	------	------	------	3,500	------	1,200	350	1	0	------	100	0	0
10	3,310	25	15	------	8	20	23	------	------	------	------	------	1,800	------	1,900	500	5	100	------	100	0	0
11	3,868	25	15	------	8	22	23	------	------	------	------	------	2,800	------	350	300	4	0	------	100	0	0
12	4,597	26.5	70	------	17	22	23	------	------	------	------	------	1,800	------	400	120	25	100	------	100	2	0
13	2,244	26	70	------	15	17	22	------	------	------	------	------	3,600	------	1,440	200	2	10	------	100	5	10
14	4,340	26	45	------	15	20	24	------	------	------	------	------	5,000	------	1,200	28	2	100	------	100	10	10
15	3,764	26	30	------	12	20	23	------	------	------	------	------	3,500	------	260	120	0	10	------	10	6	0
16	4,692	26	20	------	12	15	17	------	------	------	------	------	1,800	------	960	120	0	10	------	10	0	10
17	4,462	26	20	------	12	16	15	------	------	------	------	------	10,200	------	900	130	2	0	------	10	10	8
18	4,798	26	20	------	10	17	17	------	------	------	------	------	2,200	------	960	160	0	0	------	10	10	3
19	4,848	26	18	------	10	15	16	------	------	------	------	------	720	------	210	90	0	0	------	10	4	0
20	4,816	26	18	------	10	19	20	------	------	------	------	------	4,000	------	340	72	0	10	------	10	6	0
21	4,766	26	18	------	10	16	19	------	------	------	------	------	700	------	230	110	4	0	------	0	2	0
22	4,188	26	15	------	10	15	18	------	------	------	------	------	1,200	------	170	120	1	0	------	0	2	4
23	3,750	26	15	------	10	16	18	------	------	------	------	------	2,100	------	220	60	1	0	------	10	2	0
24	4,676	26	15	------	10	15	15	------	------	------	------	------	3,000	------	960	400	1	0	------	100	2	2
25	4,718	26	15	------	10	14	15	------	------	------	------	------	2,400	------	720	240	1	0	------	10	2	4
26	4,248	26	15	------	10	15	16	------	------	------	------	------	4,000	------	1,200	280	1	0	------	100	6	0
27	4,248	26	15	------	10	15	16	------	------	------	------	------	2,000	------	500	150	2	0	------	10	8	2
28	3,642	26	20	------	12	18	20	------	------	------	------	------	1,200	------	230	80	1	0	------	100	6	0
29	3,654	26	25	------	15	18	22	------	------	------	------	------	6,500	------	2,400	350	0	100	------	10	4	0

30	3,736	26	20	------	10	23	23	------	------	------	------	------	10,000	------	2,200	900	4	100	------	100	0	0
31	4,678	26	22	------	12	21	23	------	------	------	------	------	4,800	------	2,500	600	0	0	------	100	10	2
Mean	4,045	25	22	------	11	17	19	------	------	------	------	------	6,685	------	958	252	2	28	------	55	3.8	1.8
Aug., 1923																						
1	4,546	26	22	------	12	22	22	------	------	------	------	------	7,000	------	1,000	500	1	10	------	10	4	0
2	4,354	26	20	------	12	20	20	------	------	------	------	------	3,500	------	900	180	6	10	------	10	7	0
3	4,054	26	25	------	12	15	16	------	------	------	------	------	30,000	------	600	140	2	10	------	100	0	0
4	3,826	26	40	------	15	20	20	------	------	------	------	------	2,600	------	150	60	2	100	------	100	8	4
5	3,874	26	80	------	15	24	20	------	------	------	------	------	5,000	------	1,100	600	1	100	------	100	10	0
6	4,368	26	50	------	15	15	18	------	------	------	------	------	3,800	------	2,600	1,000	1	100	------	100	0	0
7	4,246	26	30	------	15	20	20	------	------	------	------	------	3,400	------	550	500	0	100	------	100	0	0
8	4,052	26	25	------	15	19	18	------	------	------	------	------	6,600	------	2,300	350	350	1,000	------	100	8	0
9	4,054	26	20	------	15	18	18	------	------	------	------	------	1,700	------	1,200	450	90	10	------	10	2	2
10	3,841	26	20	------	13	20	22	------	------	------	------	------	4,200	------	840	260	0	100	------	10	6	0
11	3,866	26	20	------	13	20	23	------	------	------	------	------	12,000	------	1,300	900	15	0	------	10	2	0
12	3,856	26	20	------	13	20	22	------	------	------	------	------	10,000	------	3,700	1,200	5	0	------	10	3	0
13	4,144	26	20	------	13	20	20	------	------	------	------	------	5,400	------	2,300	1,100	12	10	------	100	0	0
14	4,376	26	20	------	11	20	20	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
15	4,742	26	15	------	8	18	20	------	------	------	------	------	40,000	------	960	960	0	100	------	100	0	0
16	4,588	26	15	------	8	18	20	------	------	------	------	------	2,000	------	380	330	2	0	------	0	0	0
17	4,446	26	15	------	8	18	20	------	------	------	------	------	6,000	------	1,020	400	3	0	------	10	0	0
18	3,640	26	10	------	6	18	20	------	------	------	------	------	1,300	------	260	120	6	0	------	0	0	0
19	3,816	26	10	------	5	18	19	------	------	------	------	------	800	------	120	28	0	10	------	0	0	0
20	4,174	26	10	------	6	15	15	------	------	------	------	------	300	------	200	90	0	0	------	10	2	0
21	4,348	26	10	------	6	17	18	------	------	------	------	------	700	------	360	100	4	0	------	10	4	0
22	4,476	26	10	------	10	18	16	------	------	------	------	------	3,400	------	180	25	0	0	------	0	0	0
23	4,264	25	8	------	8	18	16	------	------	------	------	------	1,000	------	120	160	0	0	------	0	0	0
24	4,072	24	8	------	6	17	17	------	------	------	------	------	700	------	110	190	0	0	------	100	0	0
25	4,062	23	6	------	6	17	18	------	------	------	------	------	600	------	340	200	0	0	------	10	0	0
26	3,980	24	6	------	6	14	16	------	------	------	------	------	1,100	------	400	300	0	0	------	0	0	0
27	4,370	24	6	------	6	16	18	------	------	------	------	------	800	------	180	140	0	10	------	0	2	0
28	4,200	24	10	------	8	20	20	------	------	------	------	------	------	------	------	------	------	10	------	0	0	0
29	4,172	24	12	------	8	20	20	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
30	3,650	24	14	------	8	20	20	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
31	3,800	24	20	------	10	19	19	------	------	------	------	------	110	------	------	------	0	0	------	10	0	0
Mean	4,137	26	19	------	10	19	19	------	------	------	------	------	5,700	------	891	395	14	60	------	36	2.1	0.2
Sept., 1923																						
1	4,014	24	15	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
2	3,848	24	15	------	------	18	18	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
3	3,842	24	15	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
4	4,518	24	15	------	------	19	15	------	------	------	------	------	710	------	------	------	0	10	------	------	------	------
5	4,374	24	15	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
6	4,592	24	40	------	------	17	17	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
7	3,828	24	20	------	------	------	------	------	------	------	------	------	420	------	------	------	0	100	------	------	------	------
8	3,952	24	14	------	------	13	18	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
9	4,016	24	12	------	8	13	16	------	------	------	------	------	550	------	110	90	1	100	------	100	0	0
10	4,300	24	12	------	8	18	16	------	------	------	------	------	2,200	------	1,600	130	1	0	------	10	0	0

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923–24—Continued

EAST LIVERPOOL (OHIO) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Sept., 1923	*1,000 gallons*	*° C.*																				
11	4,114	23	12	------	8	19	18	------	------	------	------	------	3,300	------	1,150	35	0	0	------	0	0	0
12	4,494	22	10	------	8	19	19	------	------	------	------	------	2,000	------	340	140	0	10	------	10	0	0
13	4,298	22	20	------	8	18	16	------	------	------	------	------	1,600	------	400	120	0	0	------	100	0	0
14	4,258	21	15	------	8	16	14	------	------	------	------	------	900	------	310	70	0	0	------	0	2	0
15	3,840	20	10	------	8	16	17	------	------	------	------	------	300	------	35	40	0	0	------	0	0	0
16	3,208	20	10	------	8	17	17	------	------	------	------	------	3,000	------	280	100	0	0	------	0	0	0
17	4,723	20	10	------	8	18	18	------	------	------	------	------	2,700	------	920	300	1	0	------	10	0	2
18	4,308	20	10	------	8	15	15	------	------	------	------	------	1,600	------	700	140	2	0	------	0	0	0
19	3,769	20	10	------	8	16	16	------	------	------	------	------	2,400	------	500	200	0	10	------	10	0	0
20	4,181	20	10	------	8	10	15	------	------	------	------	------	800	------	310	40	0	0	------	0	2	0
21	4,350	20	40	------	10	12	12	------	------	------	------	------	2,200	------	540	340	1	0	------	10	0	0
22	3,672	20	30	------	12	12	12	------	------	------	------	------	2,100	------	950	320	2	0	------	10	2	0
23	4,516	20	30	------	10	15	15	------	------	------	------	------	8,200	------	3,200	600	1	0	------	1,000	0	0
24	4,629	21	25	------	10	18	16	------	------	------	------	------	12,000	------	3,000	1,500	0	10	------	1,000	4	0
25	4,405	22	20	------	10	20	15	------	------	------	------	------	12,000	------	4,200	1,600	0	100	------	100	2	0
26	4,319	22	18	------	8	17	14	------	------	------	------	------	6,000	------	2,900	840	1	0	------	10	2	0
27	4,142	23	15	------	5	18	17	------	------	------	------	------	1,200	------	840	320	0	0	------	10	2	0
28	4,371	22	40	------	5	15	14	------	------	------	------	------	2,800	------	450	200	1	0	------	10	0	0
29	4,138	22	30	------	5	17	16	------	------	------	------	------	1,000	------	1,000	480	1	0	------	10	0	0
30	3,871	22	25	------	8	16	21	------	------	------	------	------	2,600	------	180	250	0	10	------	10	2	0
Mean	4,126	22	19	------	8	16	16	------	------	------	------	------	3,050	------	1,080	356	0.5	15	------	110	0.82	0.09
Oct., 1923																						
1	4,418	20	15	------	5	18	20	------	------	------	------	------	3,300	------	400	250	6	0	------	0	2	2
2	4,349	20	20	------	5	18	20	------	------	------	------	------	2,200	------	300	120	26	0	------	0	0	0
3	4,311	20	15	------	5	11	20	------	------	------	------	------	400	------	160	40	3	0	------	0	0	0
4	4,051	19	15	------	5	13	16	------	------	------	------	------	700	------	140	100	1	0	------	10	0	0
5	4,365	19	15	------	5	12	15	------	------	------	------	------	1,000	------	190	12	20	0	------	0	0	0
6	3,645	18	12	------	5	10	14	------	------	------	------	------	300	------	45	25	0	0	------	0	0	2
7	3,821	18	12	------	5	13	17	------	------	------	------	------	250	------	40	50	1	0	------	0	0	0
8	3,509	18	12	------	5	16	19	------	------	------	------	------	220	------	110	25	15	0	------	100	0	2

9	4,693	17	12	......	5	15	17	......	......	......	......	......	300	......	125	140	9	0	......	0	0	0
10	4,104	16	12	......	5	12	17	......	......	......	......	......	300	......	260	75	0	0	......	10	2	0
11	4,246	16	12	......	5	10	17	......	......	......	......	......	350	......	200	18	1	10	......	10	0	0
12	3,865	16	12	......	5	11	17	......	......	......	......	......	500	......	140	24	1	10	......	100	0	0
13	3,994	16	12	......	5	12	17	......	......	......	......	......	400	......	50	80	0	0	......	10	0	0
14	3,522	16	12	......	7	14	18	......	......	......	......	......	600	......	90	40	25	0	......	10	2	0
15	4,033	16	12	......	8	16	20	......	......	......	......	......	800	......	125	22	4	0	......	100	0	0
16	4,525	17	12	......	8	18	22	......	......	......	......	......	2,000	......	190	20	5	10	......	100	0	0
17	5,150	17	30	......	10	17	20	......	......	......	......	......	2,000	......	1,800	130	18	100	......	100	2	2
18	5,106	17	30	......	15	15	20	......	......	......	......	......	2,500	......	1,200	130	26	10	......	100	0	0
19	3,061	17	22	......	10	15	18	......	......	......	......	......	3,400	......	1,700	400	35	100	......	1,000	8	0
20	3,526	17	15	......	10	18	20	......	......	......	......	......	3,300	......	1,600	330	12	100	......	100	4	0
21	3,677	16	15	......	10	17	20	......	......	......	......	......	3,500	......	1,600	700	1	1,000	......	1,000	6	2
22	4,071	15	12	......	10	17	20	......	......	......	......	......	9,000	......	3,200	460	150	10	......	100	4	0
23	3,832	14	12	......	8	16	18	......	......	......	......	......	9,000	......	1,900	470	90	100	......	1,000	4	2
24	4,001	13	12	......	8	16	18	......	......	......	......	......	5,000	......	1,400	360	130	100	......	1,000	6	0
25	4,116	18	18	......	10	15	18	......	......	......	......	......	9,000	......	2,300	25	280	100	......	10	2	10
26	4,081	12	12	......	10	16	18	......	......	......	......	......	2,000	......	2,000	150	24	100	......	1,000	0	0
27	4,041	12	16	......	8	17	17	......	......	......	......	......	2,700	......	1,300	60	0	100	......	1,000	0	0
28	3,950	12	20	......	8	15	16	......	......	......	......	......	2,700	......	440	70	0	100	......	1,000	2	2
29	4,131	12	20	......	10	15	18	......	......	......	......	......	3,200	......	3,000	180	50	10	......	1,000	2	2
30	3,971	12	35	......	10	16	20	......	......	......	......	......	4,000	......	2,000	130	40	100	......	10	0	0
31	4,171	12	25	......	10	16	19	......	......	......	......	......	1,300	......	1,100	160	40	100	......	1,000	10	4
Mean	4,075	16	16	......	8	15	18	......	......	......	......	......	2,470	......	939	155	27	70	......	318	1.8	1
Nov., 1923																						
1	2,744	12	20	......	8	19	19	......	......	......	......	......	3,500	......	2,000	220	0	10	......	10	10	0
2	4,542	12	20	......	8	19	20	......	......	......	......	......	1,800	......	650	200	0	10	......	100	0	0
3	3,850	10	25	......	8	20	20	......	......	......	......	......	4,000	......	900	80	0	100	......	1,000	3	0
4	3,472	10	30	......	8	20	21	......	......	......	......	......	23,000	......	750	170	1	......	......	1,000	0	0
5	3,855	10	20	......	10	20	25	......	......	......	......	......	3,100	......	1,000	170	4	1,000	......	1,000	4	0
6	3,766	11	35	......	8	20	23	......	......	......	......	......	6,100	......	2,100	230	3	1,000	......	1,000	0	0
7	3,832	11	35	......	8	20	21	......	......	......	......	......	4,400	......	2,500	220	26	10	......	100	6	0
8	4,012	10	80	......	7	15	20	......	......	......	......	......	12,000	......	4,000	280	35	100	......	1,000	0	0
9	3,661	10	70	......	5	15	14	......	......	......	......	......	2,200	......	1,250	160	8	100	......	100	0	0
10	3,526	11	50	......	5	11	14	......	......	......	......	......	2,500	......	1,100	100	25	100	......	10	0	0
11	3,509	10	25	......	4	8	15	......	......	......	......	......	520	......	8	6	1	100	......	10	0	0
12	3,886	10	25	......	4	5	15	......	......	......	......	......	500	......	13	3	0	10	......	10	0	0
13	3,910	9	20	......	4	10	18	......	......	......	......	......	1,800	......	150	10	3	100	......	100	0	0
14	3,760	9	15	......	4	6	18	......	......	......	......	......	150	......	32	1	0	100	......	10	0	0
15	3,689	9	15	......	4	6	18	......	......	......	......	......	160	......	50	8	5	10	......	......	0	0
16	3,691	9	15	......	4	7	18	......	......	......	......	......	80	......	26	6	0	......	......	100	2	0
17	3,381	9	15	......	5	8	15	......	......	......	......	......	140	......	48	16	4	10	......	0	2	0
18	3,431	9	15	......	5	6	14	......	......	......	......	......	200	......	40	8	0	10	......	10	0	0
19	4,173	9	15	......	8	8	13	......	......	......	......	......	400	......	280	7	1	10	......	100	0	0
20	3,816	8	15	......	8	8	13	......	......	......	......	......	700	......	270	20	0	10	......	100	0	0
21	3,791	8	15	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
22	3,695	8	15	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
23	3,649	8	30	......	......	12	20	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
24	3,514	8	30	......	......	15	22	......	......	......	......	......	......	......	......	......	......	......	......	......	0	0
25	3,291	8	40	......	10	16	23	......	......	......	......	......	3,300	......	370	75	2	1,000	......	1,000	0	0

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923-24—Continued

EAST LIVERPOOL (OHIO) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Nov., 1923	*1,000 gallons*	*° C.*																				
26	3,876	9	60	......	10	16	23	......	......	......	......	......	5,000	......	1,200	340	150	10,000	......	100	0	0
27	3,912	9	40	......	8	15	22	......	......	......	......	......	2,800	......	700	200	240	10	......	100	0	......
28	3,602	9	35	......	7	16	24	......	......	......	......	......	1,300	......	250	34	......	10	......	100	0	......
29	3,355	8	35	......	7	17	23	......	......	......	......	......	10,000	......	250	60	......	100	......	10	0	......
30	3,447	8	25	......	7	18	25	......	......	......	......	......	6,000	......	540	8	......	100	......	100	0	......
Mean	3,688	9	31	......	7	13	19	......	......	......	......	......	3,680	......	714	101	22	500	......	287	1	0
Dec., 1923																						
1	3,467	8	400	......	10	18	37	......	......	......	......	......	9,600	......	1,040	80	......	1,000	......	100	0	......
2	3,250	8	300	......	10	23	30	......	......	......	......	......	8,500	......	850	480	......	1,000	......	1,000	0	......
3	3,836	7	250	......	10	24	29	......	......	......	......	......	7,000	......	1,250	270	......	100	......	1,000	0	......
4	4,030	7	250	......	15	23	28	......	......	......	......	......	9,200	......	1,900	260	......	1,000	......	1,000	6	......
5	3,884	7	250	......	20	26	35	......	......	......	......	......	6,000	......	900	160	......	10,000	......	10,000	8	......
6	3,725	9	575	......	58	28	38	......	......	......	......	......	27,000	......	7,000	610	450	10,000	......	10,000	10	2
7	3,756	9	1,500	......	25	36	32	......	......	......	......	......	20,000	......	4,600	1,100	680	10,000	......	1,000	8	6
8	3,424	9	1,200	......	40	18	28	......	......	......	......	......	4,400	......	900	96	110	10,000	......	1,000	8	6
9	3,362	9	450	......	10	15	19	......	......	......	......	......	6,800	......	240	36	16	1,000	......	100	2	0
10	4,024	9	300	......	32	23	21	......	......	......	......	......	7,500	......	630	168	26	10,000	......	10,000	10	4
11	3,784	9	300	......	10	11	20	......	......	......	......	......	5,000	......	700	67	3	1,000	......	1,000	6	0
12	3,754	9	275	......	12	12	20	......	......	......	......	......	3,000	......	530	48	3	1,000	......	1,000	8	2
13	3,682	9	250	......	10	12	18	......	......	......	......	......	3,500	......	180	10	2	10,000	......	100	4	0
14	3,718	8	150	......	12	15	20	......	......	......	......	......	6,000	......	340	58	4	1,000	......	1,000	8	2
15	4,076	7	125	......	17	13	25	......	......	......	......	......	2,500	......	520	56	1	100	......	10,000	0	0
16	3,500	7	125	......	15	13	26	......	......	......	......	......	650	......	225	7	2	1,000	......	100	4	0
17	3,900	7	100	......	20	15	21	......	......	......	......	......	1,700	......	540	14	6	100	......	1,000	10	8
18	3,944	5	90	......	15	20	22	......	......	......	......	......	1,800	......	240	8	3	1,000	......	1,000	2	0
19	3,821	5	90	......	12	15	25	......	......	......	......	......	900	......	116	5	1	100	......	1,000	0	0
20	4,018	5	80	......	10	10	20	......	......	......	......	......	2,400	......	62	1	0	100	......	100	0	0
21	3,743	7	60	......	10	19	19	......	......	......	......	......	2,500	......	20	1	2	10	......	100	0	0

22......	3,203	8	125	......	8	19	18	......	......	......	......	......	3,000	......	......	......	......	1,000	......	10,000	0	0
23......	3,166	9	400	......	10	21	22	......	......	......	......	......	19,000	......	900	18	0	1,000	......	10,000	0	0
24......	3,280	9	400	......	......	......	22	......	......	......	......	......	......	......	......	......	......	1,000	......	100	7	0
25......	3,138	7	350	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
26......	3,581	......	300	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
27......	3,606	6	160	......	......	15	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
28......	3,591	7	160	......	12	16	18	......	......	......	......	......	5,000	......	400	6	0	10,000	......	1,000	2	0
29......	3,365	6	250	......	12	11	20	......	......	......	......	......	1,800	......	80	5	3	10.000	......	1,000	2	0
30......	3,118	6	400	......	10	10	12	......	......	......	......	......	2,000	......	75	0	0	1,000	......	100	0	0
31......	3,537	6	400	......	15	14	15	......	......	......	......	......	2,500	......	160	1	0	10,000	......	1,000	2	0
Mean	3,622	7	332	......	22	18	23	......	......	......	......	......	6,328	......	938	137	60	3,700	......	2,670	3.8	1.3
Jan., 1924																						
1......	3,269	6	500	......	17	10	17	......	......	......	......	......	2,300	......	360	30	0	100	......	1,000	8	0
2......	3,648	6	700	......	15	11	11	......	......	......	......	......	2,800	......	70	1	0	1,000	......	100	4	0
3......	3,748	6	800	......	17	11	11	......	......	......	......	......	2,900	......	180	0	0	100	......	1,000	0	0
4......	3,657	5	1,400	......	20	11	10	......	......	......	......	......	2,000	......	156	0	0	10,000	......	100	0	0
5......	3,845	5	900	......	17	12	10	......	......	......	......	......	3,500	......	160	28	0	100	......	1,000	0	0
6......	3,475	3	500	......	28	12	11	......	......	......	......	......	500	......	50	1	2	1,000	......	100	0	0
7......	4,576	1	250	......	28	11	11	......	......	......	......	......	350	......	70	2	1	100	......	10	0	0
8......	4,515	1	150	......	30	9	7	......	......	......	......	......	100	......	65	0	1	10,000	......	100	0	0
9......	4,352	1	125	......	15	11	15	......	......	......	......	......	700	......	96	4	0	100	......	100	0	0
10......	3,913	1	100	......	11	7	16	......	......	......	......	......	800	......	65	0	0	1,000	......	100	0	0
11......	3,900	2	1,300	......	50	10	21	......	......	......	......	......	8,500	......	900	150	3	1,000	......	1,000	6	0
12......	3,832	2	800	......	22	12	21	......	......	......	......	......	5,000	......	400	50	12	1,000	......	1,000	2	0
13......	3,858	2	500	......	30	12	20	......	......	......	......	......	8,000	......	400	30	6	10,000	......	100	4	0
14......	4,204	2	400	......	20	15	25	......	......	......	......	......	5,500	......	600	25	50	10,000	......	10,000	0	0
15......	4,105	2	300	......	25	10	22	......	......	......	......	......	2,300	......	400	12	5	1,000	......	100	4	2
16......	4,071	2	800	......	20	11	24	......	......	......	......	......	5,000	......	140	1	5	10,000	......	1,000	0	0
17......	4,122	2	1,000	......	55	20	23	......	......	......	......	......	10,000	......	1,800	280	380	10,000	......	10,000	10	6
18......	4,117	2	600	......	10	10	15	......	......	......	......	......	3,500	......	350	10	2	10,000	......	100	0	0
19......	3,731	2	400	......	25	12	20	......	......	......	......	......	3,500	......	110	4	2	100	......	100	4	0
20......	4,129	3	250	......	10	14	20	......	......	......	......	......	4,000	......	70	5	0	100	......	100	0	0
21......	4,573	1	200	......	17	10	19	......	......	......	......	......	2,500	......	290	5	1	100	......	1,000	0	0
22......	4,653	1	150	......	......	10	21	......	......	......	......	......	1,100	......	140	0	0	100	......	100	0	0
23......	4,431	1	150	......	17	15	28	......	......	......	......	......	800	......	110	5	1	100	......	100	0	0
24......	3,903	2	125	......	12	17	31	......	......	......	......	......	3,000	......	160	6	0	100	......	100	0	0
25......	4,394	2	100	......	12	17	26	......	......	......	......	......	500	......	170	2	0	1,000	......	100	0	0
26......	4,448	2	90	......	12	7	17	......	......	......	......	......	1,000	......	68	2	4	100	......	100	0	0
27......	4,163	2	80	......	10	4	10	......	......	......	......	......	500	......	25	10	1	1,000	......	10	0	0
28......	4,172	2	70	......	15	6	11	......	......	......	......	......	180	......	14	4	0	100	......	10	0	0
29......	3,987	2	60	......	12	15	22	......	......	......	......	......	100	......	10	0	0	100	......	10	0	0
30......	4,210	2	120	......	12	30	33	......	......	......	......	......	900	......	80	4	0	1,000	......	100	0	0
31......	3,700	2	200	......	15	20	57	......	......	......	......	......	100	......	250	0	3	10,000	......	10	0	0
Mean	4,055	2	414	......	21	12	19	......	......	......	......	......	2,670	......	250	22	15	2,920	......	927	1.4	0.3

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923–24—Continued

EAST LIVERPOOL (OHIO) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Feb., 1924	*1,000 gallons*	*° C.*																				
1	3,671	3	100	......	12	10	15	......	......	......	......	......	1,200	......	230	16	4	1,000	......	100	0	0
2	3,387	3	100	......	8	5	12	......	......	......	......	......	850	......	10	3	0	1,000	......	10	0	0
3	3,615	3	100	......	4	9	15	......	......	......	......	......	1,500	......	80	4	0	100	......	10	0	0
4	3,919	3	100	......	8	12	15	......	......	......	......	......	......	......	......	......	3	1,000	......	100	0	0
5	3,845	2	90	......	6	19	18	......	......	......	......	......	2,100	......	88	1	3	1,000	......	100	0	0
6	3,699	2	800	......	40	25	24	......	......	......	......	......	5,300	......	270	72	8	10,000	......	1,000	2	0
7	4,179	2	600	......	5	16	20	......	......	......	......	......	5,400	......	100	2	2	1,000	......	100	2	0
8	3,731	2	300	......	10	13	17	......	......	......	......	......	5,000	......	500	7	4	100	......	1,000	6	0
9	3,455	2	200	......	10	12	18	......	......	......	......	......	4,000	......	250	8	1	10,000	......	10,000	0	0
10	3,485	2	125	......	8	13	10	......	......	......	......	......	1,500	......	100	4	1	100	......	1,000	0	0
11	4,206	2	125	......	10	14	19	......	......	......	......	......	1,100	......	120	1	3	10,000	......	1,000	8	0
12	3,780	2	90	......	10	21	21	......	......	......	......	......	650	......	36	2	0	100	......	1,000	0	0
13	3,782	2	80	......	14	22	29	......	......	......	......	......	3,000	......	240	10	1	1,000	......	1,000	0	0
14	3,853	2	70	......	8	10	22	......	......	......	......	......	300	......	100	10	0	100	......	1,000	0	0
15	3,912	2	60	......	8	8	15	......	......	......	......	......	250	......	36	4	0	100	......	100	0	0
16	3,496	2	60	......	10	8	11	......	......	......	......	......	200	......	20	3	1	10	......	10	0	0
17	3,539	2	50	......	10	10	11	......	......	......	......	......	80	......	10	3	0	100	......	10	0	0
18	3,913	2	40	......	10	18	15	......	......	......	......	......	200	......	25	0	0	10	......	10	0	0
19	4,087	2	60	......	10	8	15	......	......	......	......	......	210	......	10	2	0	10	......	10	0	0
20	3,856	2	90	......	8	6	10	......	......	......	......	......	500	......	12	6	3	100	......	100	0	0
21	4,002	2	800	......	8	8	9	......	......	......	......	......	1,500	......	12	0	0	100	......	10	0	0
22	3,940	2	1,400	......	25	8	10	......	......	......	......	......	1,400	......	230	4	1	100	......	100	0	0
23	3,812	2	600	......	20	7	13	......	......	......	......	......	2,500	......	340	30	3	100	......	100	0	0
24	3,578	2	550	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
25	4,192	2	450	......	15	13	23	......	......	......	......	......	600	......	48	0	0	100	......	10	2	0
26	4,061	2	60	......	8	14	15	......	......	......	......	......	450	......	48	5	0	10	......	100	0	0
27	4,047	2	60	......	8	12	18	......	......	......	......	......	150	......	80	0	0	100	......	100	0	0
28	4,147	2	60	......	10	9	16	......	......	......	......	......	250	......	45	3	0	10	......	10	0	0
29	3,886	2	80	......	......	......	......	......	......	......	......	......	300	......	20	0	0	10	......	10	0	0
Mean	3,830	2	252	......	11	12	16	......	......	......	......	......	1,500	......	116	8	1	1,330	......	646	0.71	0

March, 1924																					
1	3,644	2	80	------	18	16	17	------	------	------	------	------	800	------	80	6	0	10	------	10	2	0
2	3,598	2	200	------	------	12	19	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
3	4,023	2	300	------	------	14	20	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
4	4,204	2	350	------	------	20	19	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
5	4,093	2	1,200	------	30	23	20	------	------	------	------	------	10,000	------	500	50	0	10,000	------	10,000	4	0
6	4,082	2	800	------	12	17	17	------	------	------	------	------	3,000	------	100	3	1	10,000	------	100	0	0
7	3,802	2	400	------	15	15	14	------	------	------	------	------	4,500	------	180	------	0	1,000	------	1,000	------	0
8	3,501	2	200	------	15	12	16	------	------	------	------	------	2,500	------	260	4	0	10,000	------	1,000	4	0
9	3,640	2	190	------	15	16	19	------	------	------	------	------	1,800	------	230	4	1	100	------	100	2	0
10	3,721	2	190	------	15	17	19	------	------	------	------	------	1,800	------	520	30	2	100	------	1,000	6	0
11	4,130	3	150	------	15	15	20	------	------	------	------	------	800	------	280	12	2	10,000	------	1,000	10	0
12	3,587	3	150	------	10	13	19	------	------	------	------	------	1,500	------	220	2	0	10,000	------	100	0	0
13	3,881	3	100	------	8	14	17	------	------	------	------	------	500	------	70	6	0	100	------	100	0	0
14	3,801	4	150	------	15	23	23	------	------	------	------	------	250	------	65	3	1	100	------	100	2	0
15	3,381	4	100	------	10	20	22	------	------	------	------	------	400	------	60	3	0	100	------	100	2	0
16	3,391	4	80	------	------	------	------	------	------	------	------	------	280	------	12	5	0	1,000	------	1,000	0	0
17	3,911	4	60	------	10	16	18	------	------	------	------	------	800	------	100	1	0	100	------	100	2	0
18	3,865	4	60	------	14	20	22	------	------	------	------	------	600	------	60	5	1	1,000	------	10	0	0
19	3,822	4	60	------	10	12	22	------	------	------	------	------	150	------	30	2	0	100	------	100	2	0
20	3,672	4	50	------	12	14	18	------	------	------	------	------	250	------	46	3	2	10	------	10	0	0
21	3,935	5	70	------	8	5	14	------	------	------	------	------	1,000	------	60	6	0	10	------	10	0	0
22	3,444	5	70	------	10	9	12	------	------	------	------	------	400	------	22	2	0	1,000	------	10	0	0
23	3,412	6	120	------	10	12	13	------	------	------	------	------	160	------	24	4	2	100	------	10	0	0
24	3,971	6	500	------	15	18	20	------	------	------	------	------	4,000	------	460	60	12	10,000	------	1,000	8	0
25	3,993	6	400	------	25	19	20	------	------	------	------	------	3,800	------	360	50	0	1,000	------	100	8	0
26	3,874	6	300	------	15	15	22	------	------	------	------	------	2,600	------	180	13	2	1,000	------	1,000	8	0
27	3,778	7	400	------	12	20	33	------	------	------	------	------	5,000	------	280	40	3	10,000	------	10,000	6	4
28	3,777	7	300	------	5	18	20	------	------	------	------	------	1,800	------	54	20	0	10,000	------	10	0	0
29	3,257	8	400	------	5	17	18	------	------	------	------	------	1,100	------	32	5	0	10,000	------	100	0	0
30	3,547	8	1,800	------	6	16	18	------	------	------	------	------	5,000	------	36	5	0	1,000	------	10	0	0
31	3,749	8	1,600	------	52	13	17	------	------	------	------	------	3,600	------	20	9	4	1,000	------	10	6	0
Mean	3,757	4	350	------	15	16	19	------	------	------	------	------	2,030	------	160	13	1	3,530	------	1,000	2.7	0.1
April, 1924																						
1	3,717	8	600	------	15	13	14	------	------	------	------	------	2,300	------	150	18	3	1,000	------	100	8	0
2	3,856	8	250	------	12	13	15	------	------	------	------	------	1,100	------	60	8	3	10,000	------	1,000	4	0
3	3,787	7	225	------	5	12	15	------	------	------	------	------	1,000	------	62	0	0	10,000	------	1,000	0	0
4	3,900	7	200	------	12	11	15	------	------	------	------	------	400	------	52	2	0	10,000	------	1,000	4	0
5	3,015	7	125	------	5	11	15	------	------	------	------	------	660	------	60	2	0	1,000	------	100	[illegible]	0
6	3,450	7	110	------	5	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
7	3,675	7	100	------	5	14	19	------	------	------	------	------	3,500	------	180	4	1	1,000	------	1,000	0	0
8	3,637	7	175	------	5	9	13	------	------	------	------	------	760	------	28	1	0	100	------	10	2	0
9	3,787	7	175	------	25	10	14	------	------	------	------	------	1,500	------	330	2	2	100	------	10	4	0
10	3,712	8	175	------	8	12	16	------	------	------	------	------	6,000	------	1,600	21	0	1,000	------	100	6	0
11	3,712	8	150	------	10	11	14	------	------	------	------	------	2,200	------	250	18	0	100	------	100	8	0
12	3,372	8	100	------	5	------	12	------	------	------	------	------	900	------	60	1	1	1,000	------	100	0	0
13	3,262	8	100	------	5	12	12	------	------	------	------	------	1,300	------	6	3	0	100	------	10	0	0
14	4,050	8	100	------	5	14	13	------	------	------	------	------	1,600	------	210	11	0	100	------	10	0	0
15	4,012	8	100	------	5	12	15	------	------	------	------	------	900	------	400	72	0	10	------	1,000	0	0

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923–24—Continued

EAST LIVERPOOL (OHIO) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
April, 1924	*1,000 gallons*	*° C.*																				
16	3,637	8	80	------	5	15	17	------	------	------	------	------	1,500	------	470	36	0	100	------	100	0	0
17	3,712	8	80	------	5	9	19	------	------	------	------	------	2,700	------	210	26	0	1,000	------	10	0	0
18	3,787	9	180	------	15	25	19	------	------	------	------	------	3,000	------	380	25	0	1,000	------	10,000	10	0
19	3,337	9	150	------	15	26	32	------	------	------	------	------	3,000	------	640	24	8	10,000	------	10,000	6	0
20	3,335	9	200	------	5	20	30	------	------	------	------	------	4,800	------	230	80	3	10,000	------	1,000	6	0
21	3,862	9	150	------	5	20	20	------	------	------	------	------	2,500	------	200	3	0	10,000	------	100	2	0
22	3,849	10	100	------	10	18	24	------	------	------	------	------	4,400	------	370	14	2	10,000	------	1,000	6	2
23	3,937	10	100	------	8	17	23	------	------	------	------	------	6,700	------	220	14	0	1,000	------	1,000	4	6
24	3,900	10	80	------	8	16	21	------	------	------	------	------	3,700	------	6	27	0	10,000	------	100	10	4
25	3,752	10	80	------	5	14	20	------	------	------	------	------	1,800	------	100	4	0	1,000	------	1,000	4	2
26	3,500	11	100	------	7	15	21	------	------	------	------	------	15,000	------	500	26	1	1,000	------	1,000	4	0
27	3,539	12	70	------	5	14	19	------	------	------	------	------	840	------	115	72	2	1,000	------	------	10	0
28	3,825	14	40	------	5	19	25	------	------	------	------	------	1,300	------	360	100	2	1,000	------	1,000	8	6
29	3,937	14	110	------	6	20	25	------	------	------	------	------	3,200	------	440	54	0	1,000	------	1,000	2	0
30	4,012	14	80	------	6	18	27	------	------	------	------	------	3,500	------	520	32	1	1,000	------	10	0	0
Mean	3,696	9	147	------	8	15	19	------	------	------	------	------	2,830	------	283	24	1	3,240	------	1,170	3.7	0.7
May, 1924																						
1	3,986	14	180	------	15	22	28	------	------	------	------	------	1,500	------	380	40	0	1,000	------	10,000	4	0
2	3,811	14	170	------	4	9	19	------	------	------	------	------	2,300	------	150	26	0	1,000	------	10	0	2
3	3,363	------	150	------	4	8	16	------	------	------	------	------	1,500	------	130	3	0	1,000	------	1,000	0	0
4	3,548	------	170	------	7	17	------	------	------	------	------	------	6,300	------	132	24	0	1,000	------	1,000	0	0
5	3,964	------	150	------	15	20	28	------	------	------	------	------	5,600	------	1,200	86	26	100,000	------	1,000	10	0
6	3,875	------	140	------	15	19	25	------	------	------	------	------	3,300	------	360	34	5	10,000	------	1,000	4	0
7	3,966	------	90	------	10	20	26	------	------	------	------	------	12,000	------	1,500	120	40	10,000	------	100	10	10
8	3,856	16	60	------	8	19	20	------	------	------	------	------	3,000	------	1,100	100	6	10,000	------	10,000	6	0
9	3,753	------	110	------	8	20	20	------	------	------	------	------	3,000	------	1,560	75	0	1,000	------	1,000	0	0
10	3,483	------	600	------	8	12	19	------	------	------	------	------	8,500	------	750	210	1	1,000	------	1,000	2	0
11	3,391	------	600	------	10	13	15	------	------	------	------	------	7,000	------	1,500	500	1	10,000	------	10,000	6	0
12	4,065	------	175	------	15	14	16	------	------	------	------	------	14,000	------	1,500	360	4	1,000	------	1,000	8	0
13	3,961	------	800	------	22	13	20	------	------	------	------	------	10,000	------	700	68	0	1,000	------	1,000	2	0
14	3,804	------	1,000	------	10	15	14	------	------	------	------	------	41,000	------	160	30	0	10,000	------	100	2	0
15	3,800	12	300	------	8	15	16	------	------	------	------	------	11,000	------	500	50	0	10,000	------	100	0	0

16	3,711	......	200	......	5	16	15	......	......	......	......	......	2,000	......	110	6	0	1,000	......	1,000	2	0
17	3,451	......	200	......	8	18	18	......	......	......	......	......	3,000	......	460	15	0	1,000	......	10,000	0	0
18	3,112	......	150	......	10	17	20	......	......	......	......	......	......	......	......	......	......	10,000	......	10,000	0	0
19	3,718	......	250	......	15	20	17	......	......	......	......	......	2,000	......	280	14	2	10,000	......	1,000	2	0
20	3,611	......	200	......	8	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
21	3,541	......	150	......	5	......	......	......	......	......	......	......	4,500	......	......	......	0	10,000	......	......	......	0
22	3,669	......	125	......	8	20	21	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
23	3,579	......	100	......	8	......	......	......	......	......	......	......	2,000	......	......	......	1	1,000	......	......	......	0
24	3,197	......	125	......	5	......	19	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
25	3,352	......	100	......	10	27	24	......	......	......	......	......	7,000	......	500	140	0	100,000	......	1,000	0	0
26	3,769	......	80	......	10	20	25	......	......	......	......	......	......	......	1,000	60	......	10,000	......	10,000	0	0
27	3,670	16	70	......	8	20	28	......	......	......	......	......	11,000	......	1,450	......	1	10,000	......	1,000	0	0
28	3,691	......	50	......	8	21	26	......	......	......	......	......	4,500	......	800	300	2	10,000	......	100	0	0
29	3,421	......	50	......	8	20	27	......	......	......	......	......	3,400	......	1,100	14	0	100	......	100	0	0
30	3,012	......	80	......	10	20	28	......	......	......	......	......	14,000	......	460	4,800	2	10,000	......	100	6	0
31	3,323	......	80	......	8	14	28	......	......	......	......	......	9,000	......	800	100	1	100	......	1,000	2	0
Mean	3,570	14	216	......	10	17	22	......	......	......	......	......	7,400	......	772	120	4	12,200	......	2,830	2.5	0.4
June, 1924																						
1	3,209	......	110	......	8	10	15	......	......	......	......	......	2,800	......	800	......	380	100	......	10	0	0
2	3,771	......	90	......	8	18	19	......	......	......	......	......	3,000	......	......	30	2	100	......	1,000	4	0
3	4,719	......	80	......	10	16	24	......	......	......	......	......	1,800	......	900	300	2	10	......	1,000	6	2
4	4,121	......	60	......	8	14	21	......	......	......	......	......	13,000	......	900	300	2	10	......	100	0	0
5	3,653	17	40	......	8	23	26	......	......	......	......	......	100	......	140	200	1	10	......	100	0	2
6	3,591	......	80	......	10	13	26	......	......	......	......	......	200	......	30	12	1	10	......	10	0	0
7	3,221	......	60	......	10	11	29	......	......	......	......	......	1,200	......	1,000	550	50	100	......	1,000	0	0
8	3,232	......	40	......	10	17	28	......	......	......	......	......	60	......	1,400	800	1	100	......	10	2	0
9	3,666	......	70	......	10	27	28	......	......	......	......	......	1,500	......	900	560	0	10	......	10	2	4
10	3,716	......	40	......	8	29	33	......	......	......	......	......	12,000	......	4,500	1,400	300	100	......	1,000	10	8
11	3,746	......	40	......	8	23	30	......	......	......	......	......	24,000	......	3,600	......	150	100	......	100	6	0
12	3,531	20	60	......	8	22	27	......	......	......	......	......	27,000	......	1,400	1,100	3	1,000	......	1,000	0	0
13	3,823	......	40	......	8	24	30	......	......	......	......	......	7,000	......	3,000	1,300	1	1,000	......	1;000	8	0
14	3,671	......	20	......	5	22	30	......	......	......	......	......	11,000	......	1,100	600	3	100	......	1,000	2	0
15	3,397	......	20	......	8	18	27	......	......	......	......	......	4,800	......	1,900	700	1	100	......	100	6	0
16	4,211	......	20	......	8	17	26	......	......	......	......	......	6,000	......	840	280	0	1,000	......	1,000	0	0
17	3,985	......	20	......	8	15	26	......	......	......	......	......	19,000	......	600	380	2	100	......	100	0	0
18	3,891	......	20	......	8	17	28	......	......	......	......	......	22,000	......	700	460	0	10,000	......	100	0	0
19	4,174	......	160	......	10	12	20	......	......	......	......	......	500	......	210	65	0	1,000	......	1,000	0	0
20	4,211	......	30	......	8	20	22	......	......	......	......	......	3,700	......	......	260	0	100	......	100	4	0
21	3,696	21	30	......	8	20	23	......	......	......	......	......	3,400	......	1,000	240	1,000	1,000	......	100	0	0
22	3,732	......	20	......	8	16	22	......	......	......	......	......	3,200	......	1,600	230	230	100	......	1,000	0	0
23	4,361	......	20	......	8	......	......	......	......	......	......	......	8,400	......	3,600	2,700	20	1,000	......	100	6	0
24	4,289	......	15	......	8	17	23	......	......	......	......	......	20,000	......	3,000	500	2	100	......	1,000	0	0
25	4,276	......	10	......	10	18	24	......	......	......	......	......	15,000	......	3,000	480	1	1,000	......	100	2	0
26	4,371	......	20	......	8	16	19	......	......	......	......	......	2,000	......	750	300	8	1,000	......	100	0	0
27	4,331	......	20	......	10	24	24	......	......	......	......	......	15,000	......	3,000	150	3	10,000	......	100	0	0
28	3,767	......	515	......	10	20	23	......	......	......	......	......	100	......	250	170	0	10,000	......	1,000	2	0
29	3,848	......	2,200	......	70	18	19	......	......	......	......	......	18,000	......	2,400	350	3	10,000	......	10,000	10	0
30	4,446	21	1,500	......	12	15	15	......	......	......	......	......	17,000	......	3,000	2,000	10	10,000	......	10,000	8	0
Mean	3,890	19	200	......	11	19	25	......	......	......	......	......	8,760	......	1,590	586	85	1,980	......	1,110	2.6	0.5

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923-24—Continued

STEUBENVILLE (OHIO) WATER FILTRATION PLANT

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
July, 1923	*1,000 gallons*	°*C.*																				
1	4,105	25	130	16	5	4	18	--------	--------	120	30	-------	600	60	14	2	0					
2	5,112	25	59	6	4	4	20	--------	--------	40	30	-------	220	20	13	6	0	100	-------	-------	0	0
3	4,479	26	5	5	6	5	19	--------	--------	600	280	-------	100	30	9	0	0	0	-------	-------	0	0
4	4,932	26	5	5	4	4	15	--------	--------	400	200	-------	110	120	5	3	0	0	-------	-------	0	0
5	4,298	26	6	6	6	5	22	--------	--------	4	21	-------	550	4,000	7	2	0	0	-------	-------	0	0
6	4,853	26	6	9	6	5	21	--------	--------	200	200	-------	10	10	1	0	0	10	-------	-------	0	0
7	4,653	27	4	8	6	7	26	--------	--------	120	200	-------	90	50	86	2	12	10	-------	-------	0	0
8	3,520	27	6	6	8	6	20	--------	--------	500	75	-------	420	40	14	4	1	0	-------	-------	0	0
9	5,368	27	6	6	8	6	22	--------	--------	13	30	-------	400	60	13	3	0	100	-------	-------	4	0
10	4,681	27	18	6	8	8	20	--------	--------	10	50	-------	350	120	9	1	0	10	-------	-------	0	0
11	5,328	27	10	18	17	5	20	--------	--------	13	2	-------	230	200	10	10	1	10	-------	-------	0	0
12	4,189	27	77	18	14	8	19	--------	--------	240	120	-------	4,800	340	34	6	3	1,000	-------	-------	0	0
13	4,989	27	58	9	8	7	20	--------	--------	120	40	-------	4,000	1,500	33	1	3	10,000	-------	-------	0	0
14	4,665	28	23	6	7	7	21	--------	--------	1,200	120	-------	1,800	400	40	3	1	100	-------	-------	0	0
15	4,315	28	8	6	6	4	20	--------	--------	1,200	200	-------	4.800	1,500	320	20	3	100	-------	-------	0	0
16	5,005	27	9	5	7	8	21	--------	--------	400	180	-------	800	6,000	500	80	1	100	-------	-------	0	0
17	4,904	28	12	8	6	9	21	--------	--------	400	200	-------	3,500	4,000	750	21	1	1,000	-------	-------	0	0
18	4,927	28	7	6	6	5	17	--------	--------	500	200	-------	20	200	4	4	3	0	-------	-------	0	0
19	5,272	28	7	6	5	6	16	--------	--------	180	240	-------	120	70	20	20	2	10	-------	-------	0	0
20	4,601																					
21	5,505	28	5	4	6	7	19	--------	--------	880	240	-------	120	130	8	10	4	10	-------	-------	0	0
22	4,772	28	5	6	4	5	20	--------	--------	540	240	-------	70	160	18	160	0	0	-------	-------	0	0
23	5,072	28	4	6	7	5	21	--------	--------	420	200	-------	60	500	40	120	2	0	-------	-------	0	0
24	4,700	28	3	6	5	5	19	--------	--------	360	480	-------	2,800	200	18	9	4	0	-------	-------	0	0
25	4,814	27	5	6	7	4	18	--------	--------	13	500	-------	80	380	120	540	1	10	-------	-------	0	0
26	5,217	27	130	11	10	6	15	--------	--------	40	300	-------	130	120	8	0	0	100	-------	-------	0	0
27	4,868	27	10	10	8	5	19	--------	--------	9	200	-------	220	90	9	80	2	10	-------	-------	0	0
28	4,621	26	8	6	8	4	17	--------	--------	300	50	-------	1,200	800	120	600	2	0	-------	-------	2	0
29	5,559	27	8	7	6	5	15	--------	--------	600	300	-------	100	250	50	100	4	10	-------	-------	0	0
30	4,726	27	6	6	9	5	15	--------	--------	350	210	-------	200	410	17	11	0	0	-------	-------	0	0
31	4,639	27	7	6	6	5	18	--------	--------	200	400	-------	3,000	530	120	500	0	1,000	-------	-------	0	0
Mean	4,790	27	22	8	7	6	19	--------	--------	332	185	-------	1,030	740	82	77	2	472	-------	-------	0.2	0

Aug. 1923																					
1	5, 268	28	65	6	6	7	20	---	---	30	480	---	800	60	49	200	1	1, 000	---	---	0	2
2	4, 764	27	7	9	8	5	18	---	---	18	600	---	200	290	30	280	2	10	---	---	0	2
3	5, 269	28	5	8	6	4	21	---	---	10	50	---	120	200	23	96	0	0	---	---	0	0
4	4, 686	28	4	4	4	5	17	---	---	240	300	---	220	380	44	180	2	0	---	---	0	0
5	4, 935	27	4	4	5	4	17	---	---	400	50	---	120	130	10	3	0	0	---	---	0	0
6	4, 748	28	4	4	4	4	16	---	---	10	250	---	10	70	34	320	2	0	---	---	0	0
7	4, 626	28	6	4	6	6	21	---	---	3	250	---	20	50	20	2	0	10	---	---	0	0
8	5, 208	29	6	8	6	6	22	---	---	9	240	---	40	30	7	95	1	10	---	---	0	0
9	4, 497	28	6	6	5	5	20	---	---	8	108	---	20	120	20	84	0	0	---	---	0	0
10	5, 160	28	6	5	8	5	22	---	---	40	60	---	50	220	64	106	0	0	---	---	0	0
11	4, 507	28	4	6	6	5	17	---	---	480	600	---	370	100	10	1	0	10	---	---	0	0
12	4, 993	28	4	6	6	3	19	---	---	420	300	---	170	240	4	1	1	10	---	---	0	0
13	4, 463	28	6	5	6	6	21	---	---	20	280	---	520	390	18	4	0	0	---	---	0	0
14	4, 419	28	8	6	7	7	22	---	---	50	160	---	320	280	4	1	0	10	---	---	0	0
15	5, 254	28	11	6	8	5	18	---	---	150	160	---	1, 200	350	10	25	0	0	---	---	0	0
16	4, 676	28	8	9	7	5	18	---	---	5	400	---	570	390	35	200	1	10	---	---	0	0
17	4, 705	27	5	6	6	5	15	---	---	6	40	---	130	270	12	4	0	10	---	---	0	0
18	5, 131	27	5	6	6	4	20	---	---	120	200	---	600	200	6	1	0	0	---	---	0	0
19	4, 296	27	8	6	5	8	22	---	---	560	400	---	370	500	15	3	0	10	---	---	0	0
20	5, 140	26	8	7	5	5	21	---	---	---	120	---	600	500	5	4	0	0	---	---	0	0
21	4, 733	26	4	8	6	4	27	---	---	600	200	---	330	320	12	6	0	0	---	---	0	0
22	4, 752	26	4	6	5	4	19	---	---	1, 200	200	---	60	30	9	8	1	0	---	---	2	0
23	5, 031	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
24	4, 365	25	4	7	4	4	14	---	---	6	600	---	80	180	6	12	1	0	---	---	0	0
25	4, 825	24	4	7	6	4	16	---	---	200	1, 800	---	20	150	3	20	0	10	---	---	0	0
26	4, 007	24	12	8	4	3	15	---	---	320	250	---	350	80	1	0	0	10	---	---	0	0
27	4, 922	24	8	5	4	3	13	---	---	20	420	---	70	90	2	1	0	10	---	---	0	0
28	4, 883	24	9	6	4	4	18	---	---	120	320	---	120	80	1	0	0	10	---	---	0	0
29	4, 441	24	86	9	4	6	17	---	---	50	420	---	140	50	45	150	1	100	---	---	0	0
30	4, 656	24	18	8	6	4	19	---	---	280	500	---	75	110	8	500	0	55	---	---	0	0
31	4, 413	25	12	6	5	4	21	---	---	600	900	---	1, 500	410	25	1, 000	1	55	---	---	0	0
Mean	4, 765	27	12	6	6	5	19	---	---	206	355	---	330	210	18	110	0. 5	45	---	---	0. 07	0. 13
Sept., 1923																					
1	4, 629	25	8	6	6	6	19	---	---	600	1, 600	---	50	80	10	1, 000	0	10	---	---	0	0
2	4, 232	24	7	5	6	4	20	---	---	900	1, 200	---	12, 000	330	19	23	4	10	---	---	0	0
3	4, 237	25	8	6	5	3	16	---	---	400	1, 800	---	2, 400	880	50	1, 000	0	1, 000	---	---	0	0
4	4, 461	25	9	5	6	6	18	---	---	200	3, 000	---	1, 500	360	33	1	0	10	---	---	0	0
5	4, 634	25	8	6	6	3	18	---	---	600	1, 000	---	150	140	22	0	0	0	---	---	0	0
6	4, 755	25	8	6	5	4	19	---	---	11	300	---	100	60	8	1	0	0	---	---	0	0
7	4, 763	25	10	8	6	6	18	---	---	100	1, 500	---	70	30	8	1	0	0	---	---	0	0
8	4, 780	26	9	8	6	5	25	---	---	14	400	---	200	200	8	120	0	100	---	---	0	0
9	4, 465	25	12	7	7	4	19	---	---	800	500	---	300	100	11	240	0	10	---	---	0	0
10	4, 911	25	9	8	7	4	15	---	---	160	400	---	300	160	11	0	0	10	---	---	0	0
11	4, 815	24	8	5	5	4	14	---	---	60	550	---	20	100	4	1	1	0	---	---	0	0
12	4, 390	24	8	5	5	3	13	---	---	400	800	---	120	150	65	1	0	0	---	---	0	0
13	4, 713	23	9	6	5	5	16	---	---	400	240	---	130	40	8	0	0	0	---	---	0	0
14	4, 826	23	9	8	7	4	15	---	---	250	250	---	530	630	80	2	0	100	---	---	6	0
15	4, 563	22	12	7	8	6	15	---	---	---	---	---	2, 400	30	3	0	1	0	---	---	0	0

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923–24—Continued

STEUBENVILLE (OHIO) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Sept., 1923	*1,000 gallons*	*° C.*																				
16	4,527	21	11	9	8	5	12	------	------	------	------	------	------	------	------	------	------	10	------	------	0	0
17	4,421	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	0	------	------	0	------
18	4,388	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	10	------	------	2	------
19	4,900	21	18	6	4	5	15	------	------	200	80	------	40	90	70	17	0	10	------	------	0	0
20	2,852	21	12	5	4	3	15	------	------	240	150	------	570	50	34	6	0	0	------	------	0	0
21	4,668	21	10	8	5	4	13	------	------	30	27	------	60	70	12	6	0	0	------	------	0	0
22	5,540	22	11	6	6	5	15	------	------	420	300	------	140	50	45	0	0	100	------	------	0	0
23	3,160	22	8	7	5	4	22	------	------	500	67	------	110	150	90	1	5	0	------	------	0	0
24	5,473	23	18	9	6	5	19	------	------	300	200	------	1,500	80	40	80	11	1,000	------	------	0	0
25	5,234	24	18	7	5	5	24	------	------	70	320	------	30	110	6	12	2	0	------	------	0	0
26	6,049	24	10	9	9	5	22	------	------	480	500	------	2,400	150	90	400	2	0	------	------	0	0
27	5,919	24	8	6	6	5	19	------	------	750	350	------	380	140	60	2	1	100	------	------	0	0
28	5,205	24	8	6	10	6	21	------	------	420	480	------	450	390	230	2	0	100	------	------	0	0
29	5,155	24	11	5	7	5	23	------	------	800	280	------	580	560	115	2	0	10,000	------	------	0	0
30	5,218	24	8	6	7	4	22	------	------	1,000	3,000	------	600	140	500	122	0	10,000	------	------	0	0
Mean	4,730	24	10	7	6	5	18	------	------	390	740	------	1,000	195	62	113	1	753	------	------	0.3	0
Oct., 1923																						
1	5,007	23	9	8	9	3	20	------	------	360	200	------	50	10	2	0	0	0	------	------	0	0
2	5,092	22	11	4	5	5	17	------	------	40	105	------	10	30	3	2	0	0	------	------	0	0
3	4,812	22	7	8	4	4	18	------	------	34	160	------	140	140	59	40	0	10	------	------	0	0
4	5,322	21	6	8	4	3	17	------	------	5	2	------	60	110	18	41	1	100	------	------	0	0
5	4,028	20	7	15	5	2	16	------	------	18	80	------	240	60	3	1	0	10	------	------	0	0
6	4,387	20	12	7	5	2	15	------	------	120	250	------	80	100	4	1	1	0	------	------	0	0
7	4,550	19	11	6	4	4	18	------	------	120	160	------	330	70	3	2	1	0	------	------	0	0
8	5,496	18	7	6	5	4	18	------	------	240	120	------	240	60	2	0	0	0	------	------	0	0
9	4,465	18	7	5	6	4	19	------	------	29	150	------	90	120	3	0	0	0	------	------	0	0
10	4,654	17	8	6	4	3	14	------	------	(1)	55	------	90	40	7	4	1	10	------	------	0	0
11	4,738	17	7	6	4	3	15	------	------	52	65	------	110	70	5	1	1	0	------	------	0	0
12	4,463	17	8	7	5	2	14	------	------	24	50	------	140	60	12	1	1	0	------	------	0	0
13	4,630	17	11	6	4	1	17	------	------	12	35	------	60	80	6	0	0	10	------	------	0	0

14	4,445	17	9	7	5	2	14	-------	-------	30	45	-------	50	80	3	9	0	0	-------	-------	0	0
15	4,098	17	8	4	4	1	13	-------	-------	30	95	-------	20	30	0	0	0	0	-------	-------	0	0
16	3,846	18	8	6	4	2	15	-------	-------	30	55	-------	130	70	2	0	0	10	-------	-------	0	0
17	4,891	18	17	8	5	6	15	-------	-------	120	30	-------	150	90	5	1	0	10	-------	-------	0	0
18	4,077	19	120	6	5	6	19	-------	-------	29	60	-------	140	210	6	3	0	100	-------	-------	0	0
19	4,174	18	8	6	6	4	18	-------	-------	15	45	-------	450	30	3	0	3	0	-------	-------	0	0
20	4,012	17	11	6	4	5	23	-------	-------	25	80	-------	80	70	4	0	0	0	-------	-------	0	0
21	3,919	17	12	6	7	4	16	-------	-------	160	100	-------	30	70	2	0	0	0	-------	-------	0	0
22	4,501	16	11	5	5	5	16	-------	-------	36	24	-------	5,400	80	2	3	1	0	-------	-------	0	0
23	4,595	15	10	6	6	3	14	-------	-------	30	30	-------	100	20	0	0	-------	0	-------	-------	0	0
24	4,068	14	11	6	8	4	15	-------	-------	80	65	-------	150	90	1	0	0	0	-------	-------	0	0
25	4,648	13	8	6	6	4	16	-------	-------	100	40	-------	100	60	12	3	1	10	-------	-------	0	0
26	3,926	13	8	8	7	5	19	-------	-------	40	4	-------	110	20	3	0	0	0	-------	-------	0	0
27	3,495	14	8	6	9	5	23	-------	-------	150	40	-------	100	40	9	0	1	0	-------	-------	0	0
28	4,049	14	12	6	10	5	21	-------	-------	80	50	-------	1,100	370	28	1	0	100	-------	-------	2	0
29	4,562	14	12	8	13	6	17	-------	-------	600	200	-------	1,050	590	200	1	0	10,000	-------	-------	0	0
30	4,415	14	8	7	10	5	19	-------	-------	160	80	-------	1,200	1,300	350	43	6	0	-------	-------	0	0
31	4,683	13	10	7	10	7	19	-------	-------	200	10	-------	3,200	350	26	1	0	0	-------	-------	0	0
Mean	4,450	17	13	7	6	4	17	-------	-------	99	80	-------	490	150	25	5	1	335	-------	-------	0.06	0
Nov., 1923																						
1	4,300	13	7	9	8	6	21	-------	-------	120	1	-------	870	950	420	12	13	0	-------	-------	0	0
2	4,684	13	13	9	10	8	20	-------	-------	300	9	-------	1,800	600	200	3	0	0	-------	-------	0	0
3	3,789	12	8	8	11	5	17	-------	-------	130	6	-------	2,400	3,600	900	3	0	0	-------	-------	0	0
4	4,103	12	8	9	12	4	17	-------	-------	350	30	-------	1,500	2,000	500	2	0	0	-------	-------	0	0
5	4,286	12	8	8	12	6	20	-------	-------	360	150	-------	12,000	4,860	720	63	3	0	-------	-------	0	0
6	4,133	12	6	6	9	8	20	-------	-------	480	120	-------	2,400	3,600	800	31	0	0	-------	-------	0	0
7	4,000	12	6	6	9	11	21	-------	-------	240	40	-------	350	1,300	420	7	0	100	-------	-------	0	2
8	4,090	12	10	8	8	11	22	-------	-------	350	7	-------	2,000	2,400	480	50	1	1,000	-------	-------	2	4
9	4,003	11	16	18	15	14	21	-------	-------	300	300	-------	350	700	240	17	0	100	-------	-------	0	0
10	3,897	11	11	12	8	8	20	-------	-------	240	420	-------	140	300	63	22	2	0	-------	-------	2	0
11	3,540	12	10	10	6	5	20	-------	-------	120	30	-------	30	140	12	1	0	0	-------	-------	0	0
12	4,140	11	8	9	6	3	19	-------	-------	12	5	-------	1,500	30	6	2	0	10	-------	-------	0	0
13	4,107	11	7	9	6	0	19	-------	-------	11	8	-------	20	60	4	2	0	0	-------	-------	0	0
14	4,082	11	18	9	5	0	16	-------	-------	3	6	-------	20	20	1	0	0	0	-------	-------	0	0
15	4,179	11	8	12	4	0	16	-------	-------	2	1	-------	100	80	6	7	0	10	-------	-------	6	0
16	3,813	11	7	7	4	0	15	-------	-------	2	0	-------	230	100	2	0	0	10	-------	-------	0	0
17	3,872	10	6	5	5	5	12	-------	-------	0	3	-------	180	50	1	0	0	0	-------	-------	0	0
18	3,801	9	6	6	5	3	12	-------	-------	1	0	-------	250	50	2	1	0	10	-------	-------	0	0
19	4,013	9	19	7	6	5	22	-------	-------	5	25	-------	100	10	6	1	0	0	-------	-------	0	0
20	4,222	9	15	6	6	5	19	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
21	4,260	-------	-------	-------	-------	7	13	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
22	3,979	-------	-------	-------	-------	7	13	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
23	4,193	-------	-------	-------	-------	8	10	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
24	5,137	-------	-------	-------	-------	4	16	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
25	3,795	9	17	7	6	8	22	-------	-------	8	1	-------	3,000	170	30	1	0	10	-------	-------	0	0
26	4,093	9	17	9	10	8	19	-------	-------	45	4	-------	550	140	48	3	0	0	-------	-------	0	0
27	4,162	9	41	12	11	8	21	-------	-------	420	75	-------	1,200	370	36	1	0	0	-------	-------	0	0

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[1] Broken.

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923–24—Continued

STEUBENVILLE (OHIO) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Nov., 1923	*1,000 gallons*	*° C.*																				
28	4,289	9	23	9	8	8	22			1,200	180		2,000	100	6	1	0	10			0	0
29	3,959					5	19															
30	4,009	9	19	12	8	6	17			360	80		220	90	60	21	2	10			0	0
Mean	4,097	10	13	9	8	12	18			211	63		1,380	900	210	10	0.9	53			0.4	0.3
Dec., 1923																						
1	3,874	9	7	16	8	8	19			350	300		200	210	30	6	0	0			0	0
2	3,859	8	16	15	12	12	32			300	20		280	60	28	0	0	10			0	0
3	4,081	8	74	28	16	9	28			1,200	350		650	440	54	1	0	10			0	0
4	4,143	8	97	33	12	11	27			1,000	350		2,500	800	50	1	0	100			0	0
5	4,184	9	140	70	18	13	27			1,000	900		310	220	43	1	0	10,000			0	4
6	4,133	9	50	70	18	16	31			720	600		2,500	1,800	500	44	4	10			0	0
7	4,202	8	160	94	37	19	27			7,200	1,500		3,000	1,200	600	38	2	10			0	0
8	4,625	9	150	140	27	15	31			4,000	750		2,000	2,000	200	15	1	10			0	0
9	3,741	10	310	162	31	10	22			1,200	720		2,400	3,000	660	35	1	10			0	0
10	4,119	10	157	125	35	10	25			1,000	360		6,000	1,600	300	40	2	10			0	0
11	4,212	9	148	105	53	7	23			1,000	250		1,600	1,200	350	37	2	100			2	0
12	4,398	9	120	90	30	8	19											10			0	0
13	4,322	9	55	75	25	7	21			250	8		500	700	200	9	0	100			0	0
14	3,845	8	110	55	10	9	24			180	1		120	40	10	1	0	10			0	0
15	4,306	8	29	32	12	9	18			420	6		320	510	200	2	0	100			0	0
16	4,308	7	26	19	16	10	19			360	150		110	110	35	3	5	10			10	6
17	4,104	7	10	9	8	7	17			400	40		50	30	31	1	1	100			0	0
18	4,223	7	37	12	8	8	17			250	180		120	100	30	3	0	10			0	0
19	4,243	6	36	9	8	8	21			50	30		90	40	8	1	0	10			0	0
20	4,216	7	45	14	9	8	23			70	50		280	60	25	7	0	10			0	0
21	4,513	7	23	11	12	7	20						10	40	27	9	0	100			0	0
22	4,344	7	38	18	8	3	19						50	60	18	3	0	0			0	0
23	4,221		23	18	7	6	21															
24	4,173		68	18	10	5	25															
25	4,460		270	69	23	6	19															

26	3,978		130	38	16	4	21															
27	4,278		62	46	12	3	23															
28	3,919		75	20	16	5	28															
29	4,438	7	47	18	15	9	24			600	200		60	30	5	3	0	10			0	0
30	3,688	7	70	39	8	5	20			600	300		120	50	10	5	1	10			2	0
31	4,254	8	58	36	11	8	19			50	10		140	20	13	2	1				0	0
Mean	4,174	8	85	49	17	9	23			1,000	320		980	600	143	11	1	448			0.6	0.4
Jan., 1924																						
1	4,086	8	98	32	6	6	13			40	5		3,000	50	20	2	2	10			0	2
2	4,394	7	114	53	7	5	17			300	100		1,200	420	150	17	1	10			0	0
3	4,375	7	97	43	8	3	9			360	6		460	470	250	5	1	10			0	0
4	4,716	7	(2)	77	12	(2)	12			540	45		(2)	360	150	3	0				0	0
5	4,447	6	(2)	78	9	(2)	11			200	4		(2)	150	38	4	1				0	0
6	4,907	4	(2)	110	18	(2)	10			120	30		(2)	350	125	3	1				0	0
7	5,536	3	(2)	34	20	(2)	5			50	3		(2)	100	35	5	2				0	0
8	4,270	3	(2)	29	12	(2)	6			80	10		(2)	80	17	3	1				0	0
9	4,079	3	34	23	12	34	7			150	80		70	20	30	5	7	0			0	0
10	4,060	4	26	18	15	26	5			240	180		20	100	27	3	1	10			0	0
11	4,222																					
12	4,220		(2)	104	14	(2)	7			80	32		(2)	80	17	1	2				0	4
13	4,310		540	88	19	6	7			18	18		700	130	20	8	2	1,000			0	0
14	4,187		120	83	10	6	9			120	15		270	60	23	1	0	10			4	2
15	3,267		62	100	41	5	14			400	12		260	280	150	1	4	1,000			0	0
16	4,962	4	40	53	12	4	7			100	8		120	120	52	1	2	10			0	0
17	4,146	4	163	135	9	5	11			180	28		410	470	21	3	1	0			2	0
18	4,330	4	250	140	9	3	7			20	25		270	180	20	2	0	0			2	2
19	4,237	4	200	115	10	5	8			16	1		270	250	23	23	1	1,000			2	2
20	4,283	4	200	81	10	6	10			11	7		550	150	25	4	1	10			0	0
21	4,445	2	9	37	10	6	7			160	20		40	40	13	2	0	10			0	0
22	4,283	3	(2)	53	35	(2)	7			2	1		(2)	50	12	5	0	0			0	0
23	4,078	3	23	23	7	6	9			160	33		20	30	7	3	2	0			0	2
24	4,489	3	35	26	10	5	9			35	30		70	70	18	2	2	100			4	0
25	4,669	3	50	20	12	5	13															
26	4,804	2	(2)	32	9	(2)	14															
27	4,840	2	82	26	11	7	8			17	20		120	80	14	2	0	100			0	2
28	4,636	4	30	18	6	2	6			28	50		4,000	40	2	2	0	100			8	2
29	4,674	3	44	11	7	8	6			55	40		40	10	7	1	0	10			0	0
30	4,635	4	16	17	7	4	6			180	50		40	10	3	1	0	10			0	0
31	4,148	5	82	19	6	6	10			180	45		200	10	20	3	2	100			0	0
Mean	4,410	4	106	56	12	5	9			137	32		580	148	46	4	1	159			0.8	0.6
Feb., 1924																						
1	3,766	5	83	20	6	6	14			120	50		30	30	5	1	0	100			4	0
2	3,788	5	29	11	6	5	15			2	720		350	110	1	5	1	10			0	0
3	3,603	5	60	9	4	5	17															
4	4,054	5	110	8	4	5	15			50	200		260	40	2	1	0	100			0	0

[2] Raw-water sampling tap frozen.

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923–24—Continued

STEUBENVILLE (OHIO) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Feb., 1924	*1,000 gallons*	*° C.*																				
5	3,817	6	40	11	4	5	15	--------	--------	23	16	-------	70	20	3	1	0	10	--------	--------	6	0
6	3,727	6	45	41	5	4	15	--------	--------	15	7	-------	50	40	3	1	0	10	--------	--------	0	0
7	4,032	5	72	30	8	5	15	--------	--------	80	5	-------	150	60	12	1	0	10	--------	--------	0	0
8	3,697	5	(2)	12	6	(2)	16	--------	--------	40	5	-------	(2)	10	4	2	0	--------	--------	--------	0	0
9	3,439	4	55	12	5	6	18	--------	--------	120	20	-------	100	30	7	3	0	10	--------	--------	0	0
10	3,682	4	12	10	4	8	15	--------	--------	25	8	-------	30	20	3	1	0	0	--------	--------	0	0
11	4,335	4	20	12	6	8	15	--------	--------	45	35	-------	40	30	9	2	0	100	--------	--------	0	0
12	4,743	4	52	18	8	10	16	--------	--------	52	12	-------	70	20	5	0	0	100	--------	--------	0	0
13	4,704	5	87	18	8	5	19	--------	--------	25	10	-------	10	30	7	1	0	0	--------	--------	0	0
14	4,841	5	12	20	8	6	17	--------	--------	19	21	-------	20	30	9	1	0	10	--------	--------	0	0
15	4,697	5	14	18	6	10	18	--------	--------	200	11	-------	40	50	13	1	0	10	--------	--------	0	0
16	4,812	5	18	18	6	6	17	--------	--------	120	30	-------	40	20	6	1	0	10	--------	--------	0	0
17	4,722	4	18	19	16	4	14	--------	--------	120	22	-------	20	20	4	1	0	10	--------	--------	4	0
18	4,622	4	9	16	6	5	15	--------	--------	22	300	-------	50	40	50	5	1	0	--------	--------	0	0
19	4,832	4	12	10	7	5	15	--------	--------	80	40	-------	30	20	3	2	0	10	--------	--------	0	0
20	4,422	4	9	13	8	4	15	370	1,200	500	1,500	650	30	10	4	33	1	10	10	0	2	2
21	4,864	4	111	33	12	4	13	2,400	800	600	600	600	1,200	270	9	2	2	1,000	0	0	0	2
22	4,767	4	300	75	11	6	12	2,400	270	6	1	-------	420	30	4	1	-------	0	10	0	0	0
23	4,441	5	51	31	10	6	16	200	250	29	1	9	110	40	9	0	1	100	20	10	0	0
24	4,694	5	34	56	16	6	12	250	220	27	0	0	70	40	3	1	0	10	10	10	0	0
25	4,869	5	56	31	12	5	20	250	300	26	1	3	40	30	8	1	0	100	0	0	0	0
26	4,615	5	18	18	12	5	20	250	130	20	1	1	20	10	20	1	0	10	100	10	0	0
27	4,611	5	8	16	10	6	20	60	70	12	0	0	10	30	6	1	0	10	0	0	0	0
28	4,585	6	18	18	8	5	22	20	24	75	600	300	40	20	8	0	3	10	0	0	0	0
29	4,771	6	20	18	16	4	16	360	250	280	1,200	400	150	50	6	1	0	10	10	10	0	0
Mean	4,363	5	49	21	8	6	16	656	351	97	193	218	128	41	8	3	0.3	65	15	4	0.6	0.1
March, 1924																						
1	4,572	6	15	18	8	5	21	--------	--------	--------	--------	-------	--------	--------	--------	--------	-------	--------	--------	--------	--------	-------
2	4,705	7	17	18	8	5	17	70	53	90	55	0	20	20	6	3	0	0	0	0	0	0
3	4,237	7	17	18	6	4	16	300	130	106	40	38	20	10	4	0	3	0	10	0	0	0

4	4,607	7	17	19	6	4	19	210	310	50	48	0	20	20	7	1	0	10	0	0	4	0
5	4,632	7	43	44	12	4	18	160	200	70	80	70	60	60	16	4	1	10	0	10	2	0
6	4,603	7	82	99	17	6	21	3,200	6,000	660	300	120	170	130	25	4	1	10	0	0	2	0
7	4,425	6	53	46	15	6	23	3,000	5,000	200	180	15	60	20	13	0	2	10	10	10	0	0
8	4,470	6	33	35	13	5	19	800	800	100	1	0	40	20	13	0	0	10	0	0	0	0
9	4,427	7	28	38	17	5	20	1,500	800	65	1	0	50	60	24	0	1	10	100	100	0	0
10	4,265	7	18	18	15	5	22	300	1,600	55	4	[1]10	20	30	3	0	1	10	100	10	0	0
11	4,355	6	17	16	12	5	20	1,800	1,500	180	15	3	10	20	8	1	2	100	10	10	0	0
12	4,304	6	17	16	14	5	21	1,000	900	200	40	14	5,000	20	9	1	0	10	10	10	0	0
13	4,396	6	12	14	10	5	19	530	470	150	12	0	20	100	6	0	0	10	0	10	0	0
14	4,962	7	34	18	10	5	16	700	310	25	1	0	110	60	5	0	0	100	10	10	0	0
15	4,826	7	20	18	7	4	17	480	230	35	4	0	40	20	2	0	0	100	10	10	0	0
16	5,040	6	18	16	7	4	16	260	190	85	4	1	140	10	4	0	1	10	0	10	0	0
17	4,556	7	22	16	7	4	16	500	250	73	0	15	10	20	1	0	1	10	10	0	0	0
18	4,505	7	39	32	7	4	13	480	310	60	35	30	220	30	32	2	2	10	10	10	0	0
19	4,188	6	24	27	9	4	20	410	210	350	32	30	10	10	3	0	0	100	10	10	0	0
20	3,500	7	26	39	7	4	20	660	50	750	30	50	0	10	3	0	0	0	10	10	0	0
21	4,274	7	18	19	6	6	18	370	250	65	50	120	20	10	1	1	0	100	0	0	0	0
22	3,969	7	35	31	6	5	17	600	580	105	28	45	20	20	1	0	0	10	0	0	0	0
23	3,116	8	43	27	7	5	17	560	370	200	28	0	20	20	0	0	0	0	0	0	0	0
24	4,174	8	95	59	7	5	18	2,800	1,200	110	37	25	27	50	5	0	0	100	10	0	0	0
25	3,635	9	112	95	11	9	20	500	3,500	600	250	200	150	60	11	0	0	100	100	10	0	0
26	3,667	9	52	61	8	6	18	2,400	2,800	1,200	450	0	1,200	70	15	1	0	10	100	10	0	0
27	3,714	9	117	58	8	10	22	3,000	4,000	1,200	420	420	120	60	30	0	1	0	10	0	0	0
28	4,065	9	82	66	11	10	20	5,000	4,800	1,200	400	600	120	20	9	0	0	0	100	10	0	0
29	4,292	10	45	53	8	7	20	1,800	3,500	1,200	300	300	30	90	22	0	0	100	100	100	0	0
30	3,566	11	310	160	19	11	18	6,600	6,000	1,000	480	0	300	230	35	0	0	1,000	1,000	100	0	0
31	4,085	11	420	350	80	8	17	3,500	3,200	900	480	320	370	170	43	5	1	100	100	10	6	8
Mean	4,261	7	61	50	12	6	19	1,450	1,650	390	130	81	280	49	12	1	1	68	61	15	0.5	0.3
April, 1924																						
1	3,604	10	350	300	170	10	21	4,000	4,800	700	540	1	460	210	200	30	0	10	100	10	0	10
2	3,500	9	190	164	19	9	28	3,000	4,800	420	60	100	500	390	45	1	3	0	0	0	2	0
3	3,852	9	67	110	9	8	17	2,000	2,800	600	300	0	140	210	27	1	0	100	100	10	0	2
4	4,804	9	95	75	8	6	20	800	2,000	400	250	2	520	80	26	3	1	100	10	100	6	0
5	4,077	10	35	30	7	5	15	120	600	200	200	0	2,000	40	11	1	0	10	10	0	0	0
6	2,384	11	30	52	7	6	17	200	230	22	8	0	3,000	30	5	0	0	100	100	0	0	0
7	2,146	11	16	38	6	3	38	210	500	150	200	1	290	80	8	0	0	10	100	0	0	0
8	4,729	11	98	26	6	8	16	600	600	200	35	18	160	30	5	2	[3]	1,000		10	2	2
9	4,529	11	55	23	7	4	15	2,000	1,600	350	150	0	180	70	11	3	0	100	10	100	6	0
10	4,638	11	38	20	9	5	18	2,000	1,600	250	120	1	30	20	5	3	0	10	10	10	0	0
11	4,602	11	75	13	8	9	17	2,000	1,800	200	55	0	860	10	15	0	0	100	10	10	4	0
12	4,645	11	27	10	10	6	18	400	850	150	35	0	90	40	4	2	0	10	10	0	0	0
13	4,728	12	38	13	8	5	18	800	1,200	200	50	0	30	0	1	1	0	10	100	10	0	0
14	4,312	13	8	15	6	7	19	3,600	600	160	50	0	10	20	1	0	0	0	10	10	0	0
15	4,517	13	84	16	8	6	21	1,500	600	600	500	3	20	20	1	1	0	10	10	0	0	0
16	4,296	14	53	18	7	7	20	1,600	1,200	480	240	4	100	20	8	0	3	100	0	0	0	0
17	3,123	15	29	17	5	4	18	800	800	160	30	0	60	0	3	0	0	10	10	0	0	0
18	3,122	15	50	16	4	5	17	600	550	40	0	2	50	90	5	1	0	100	10	0	0	0

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[1] Raw-water sampling tap frozen.

[3] Bad.

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923–24—Continued

STEUBENVILLE (OHIO) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
April, 1927	*1,000 gallons*	*° C.*																				
19	3,825	14	195	26	4	7	17	2,000	500	120	14	0	350	90	2	0	0	100	10	0	0	0
20	4,493	15	280	30	8	11	22	5,000	1,600	720	20	0	1,200	20	6	1	0	100	100	0	2	0
21	4,676	14	50	20	8	6	19	500	500	300	120	0	370	40	40	9	0	10	10	10	8	0
22	4,325	13	22	17	8	7	20	350	600	300	25	2	1,200	20	15	1	0	100	100	10	0	0
23	4,277	12	32	80	10	8	22	1,000	2,000	600	200	1	100	150	10	1	1	10	100	100	0	0
24	4,460	14	37	27	8	7	26	1,500	1,200	0	600	0	190	30	0	0	0	100	0	10	0	0
25	4,621	14	57	23	4	8	25	800	500	750	320	1	120	10	5	0	0	10	0	0	0	0
26	4,848	14	33	8	7	6	20	430	450	720	700	0	20	30	2	0	0	100	10	10	0	0
27	4,300	14	19	15	6	9	20	600	600	1,000	600	0	50	50	5	0	0	10	10	10	0	0
28	3,828	15	30	17	4	9	18	1,500	600	400	280	0	4,200	20	0	0	0	10	0	10	0	0
29	4,741	15	71	16	6	9	22	2,500	500	500	200	7	160	20	2	1	0	100	100	0	0	0
30	4,475	16	71	8	4	7	18	1,800	430	150	70	4	80	10	6	0	0					
Mean	4,150	11	74	41	13	7	20	1,470	1,220	361	199	5	550	62	16	2.1	0.27	84	36	15	1	0.5
May, 1924																						
1	4,557	16	65	16	6	9	17	1,600	1,500	250	30	6	100	20	2	0	0	100	10	10	0	0
2	4,641	16	53	52	5	7	18	600	700	550	12	0	40	30	8	0	0	100	10	10	0	0
3	4,394	16	26	23	3	7	16	50	110	50	15	3	70	30	4	0	0	10	10	10	0	0
4	4,144	16	46	7	4	8	16	800	340	120	27	5	0	30	5	0	0	0	0	0	0	0
5	4,435	16	200	20	10	11	19	10,000	1,600	350	160	1	230	20	5	0	0	100	10	10	0	0
6	4,112	17	73	38	8	13	24	2,500	1,500	800	300	2	400	110	22	0	0	100	100	10	2	0
7	4,402	17	95	60	7	9	24	3,000	2,000	900	480	4	400	50	21	2	0	1,000	100	100	0	0
8	4,285	17	77	45	17	13	30	2,400	2,000	600	280	3	1,600	240	100	8	0	1,000	100	100	2	0
9	4,196	17	87	30	8	10	23	1,500	2,500	4,000	3,600	1	400	450	500	50	0	100	10	100	0	0
10	3,985	17	130	87	8	12	26	7,200	2,800	480	1,200	2	1,200	50	9	9	0	1,000	100	100	4	0
11	3,699	17	330	90	31	12	24	3,000	1,800	350	80	0	1,800	60	50	4	0	10,000	100	1,000	8	2
12	3,864	16	92	58	25	10	24	2,400	3,500	420	80	0	500	300	41	3	1	1,000	1,000	100	10	0
13	3,968	16	137	70	31	10	32	4,800	2,500	720	80	6	1,800	500	200	7	4	1,000	1,000	1,000	10	0
14	3,840	16	280	150	25	11	27	6,000	2,500	600	80	3	2,000	500	240	4	0	1,000	1,000	100	8	6
15	3,611	15	250	150	78	10	30	3,200	3,200	280	20	0	1,800	800	50	2	0	10,000	10,000	1,000	4	2
16	3,941	14	200	120	42	10	31	4,000	3,500	480	100	0	2,400	300	60	4	0	1,000	10,000	1,000	10	0

17	3,862	15	190	83	43	9	27	3,600	3,000	360	20	1	3,000	350	60	2	1	1,000	1,000	100	2	0
18	3,972	15	75	65	18	9	29	1,500	3,200	240	10	0	250	160	17	3	0	100	1,000	10	0	0
19	4,201	15	57	32	6	10	20	600	1,000	450	100	1	120	100	13	0	0	100	100	10	0	0
20	4,125	15	70	28	6	9	22	2,800	2,000	420	25	3	30	260	13	1	0	100	1,000	100	4	0
21	4,251	16	48	10	5	9	22	130	230	200	40	1	100	90	6	1	1	10	100	100	2	0
22	4,832	16	39	6	4	7	19	2,000	800	360	19	1	190	70	27	1	1	10	0	100	0	0
23	4,433	16	25	8	5	7	21	250	300	150	34	2	120	20	7	3	0	100	10	0	0	0
24	4,689	16	15	9	5	7	19	140	60	250	150	20	0	50	5	0	0	100	10	10	0	0
25	4,093	17	68	10	5	6	21	100	100	1,200	500	0	70	70	13	0	0	10	10	10	0	0
26	4,493	17	9	16	8	8	20	70	320	750	280	0	250	100	16	2	0	10	0	10	0	0
27	4,194	18	45	14	9	9	20	1,200	240	600	400	0	170	100	5	0	0	100	10	0	0	0
28	4,447	17	40	17	7	5	20	1,800	2,000	1,200	200	0	310	110	100	30	0	100	100	10	0	0
29	4,774	17	46	12	6	6	24	1,600	2,000	350	300	0	150	180	8	0	0	10	100	10	0	0
30	4,445	17	93	10	9	7	27	------	------	------	------	------	1,800	200	30	7	0	10	------	------	------	------
31	4,865	17	67	10	5	5	24	------	------	------	------	------	------	------	------	------	------	10	10	0	0	0
Mean	4,250	16	97	43	14	9	23	2,400	1,600	600	300	2	720	180	55	5	0.3	945	900	171	2.2	0.3
June, 1924																					
1	4,759	17	20	12	3	5	19	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
2	4,993	17	83	9	9	6	22	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
3	4,903	18	20	12	5	7	19	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
4	4,423	18	23	10	5	5	19	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
5	4,568	19	74	10	5	7	22	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
6	4,938	19	37	6	11	6	28	3,000	400	1,000	30	4	170	70	30	2	0	10	10	10	0	0
7	4,441	19	38	7	8	7	27	450	1,500	350	150	1	200	30	15	1	0	1,000	100	10	0	0
8	4,458	20	22	7	5	5	26	2,500	3,000	1,200	400	3	270	140	Bad.	0	0	10	100	100	0	0
9	5,047	20	20	14	6	7	23	2,000	1,800	600	350	12	400	160	16	4	0	100	10	10	0	0
10	4,744	20	17	10	6	8	30	1,500	4,800	250	200	19	1,500	420	26	4	2	100	10	10	0	0
11	4,772	21	19	5	6	6	19	------	------	------	------	------	------	------	------	------	------	10	10	0	0	0
12	4,538	21	58	8	5	6	30	4,800	4,200	200	100	0	250	230	50	7	0	100	10	10	0	0
13	5,135	21	50	12	11	7	29	160	800	150	10	3	300	100	10	4	1	100	100	10	0	0
14	4,719	22	29	5	6	8	26	100	400	150	14	0	90	50	7	0	0	100	100	100	2	0
15	4,891	22	46	6	5	9	26	1,200	1,500	240	80	5	420	80	65	75	0	100	100	0	0	0
16	5,067	23	17	5	4	8	25	1,200	2,400	400	200	1	120	150	70	70	1	10	10	10	0	0
17	4,586	23	15	8	5	7	25	2,000	3,200	240	240	10	600	450	150	150	0	100	100	10	0	0
18	5,283	24	7	5	4	5	20	1,200	4,000	280	240	12	230	600	100	30	10	10	0	10	0	0
19	5,298	24	19	7	6	6	22	200	300	800	500	150	100	70	120	60	7	10	100	10	0	0
20	5,282	25	18	6	6	8	22	2,400	1,200	1,800	600	360	370	90	200	200	Bad.	100	10	10	0	0
21	5,378	26	15	8	18	8	23	2,000	1,200	1,250	480	450	1,000	280	300	600	120	0	10	0	0	0
22	4,495	26	13	8	10	9	24	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
23	5,650	26	9	8	8	12	21	900	4,200	1,200	1,000	420	400	2,400	600	200	0	100	100	10	0	0
24	5,615	27	8	8	9	12	24	3,000	4,000	1,800	900	40	1,200	4,000	1,020	250	3	100	1,000	100	0	0
25	5,297	27	10	6	6	14	25	2,500	4,000	1,200	420	300	1,500	3,000	360	200	3	100	1,000	100	0	0
26	5,191	27	20	9	7	12	24	4,000	9,800	600	720	100	6,000	3,500	1,200	280	17	1,000	100	10	0	0
27	4,839	27	18	8	6	11	25	4,000	3,200	480	420	0	6,000	2,000	280	100	0	100	100	10	0	0
28	5,116	27	25	7	6	15	27	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
29	5,002	27	270	370	18	14	26	4,000	4,800	1,000	600	30	4,200	5,000	900	300	10	10,000	1,000	1,000	4	0
30	5,237	25	1,000	350	23	21	38	7,200	7,500	750	600	50	12,000	8,000	750	250	12	10,000	------	1,000	10	2
Mean	4,955	23	67	32	7	9	24	2,300	3,100	724	375	89	1,690	1,400	284	127	9	1,010	185	110	0.7	0.09

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923-24—Continued

HUNTINGTON (W. VA.) WATER FILTRATION PLANT

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
July, 1923	*1,000 gallons*	*° C.*																				
1	3,600																					
2	5,000		190		25	25	26						800		200	15	1	1,000			100	0
3	4,570		180		15	27	27						1,200		400	15	8	1,000			100	4
4	4,510																					
5	4,600		75		15	30	31						1,200		300	7	2	1,000			100	0
6	4,500		80		11	30	28						1,000		150	5	0	1,000			100	0
7	4,500		90		22	30	30						2,000		1,000	35	10	1,000			100	0
8	4,460																					
9	4,500		180		14	28	30						3,000		400	7	1	1,000			100	0
10	4,500		175		25	29	28						1,500		800	15	5	1,000			100	0
11	4,580		65		13	30	29						1,000		450	20	0	1,000			100	0
12	4,700		85		15	39	34						800		200	25	3	1,000			100	0
13	4,600		670		17	33	31						1,200		350	30	1	1,000			10	0
14	4,800		600		17	32	32						3,000		1,000	40	4	1,000			100	0
15	5,330																					
16	5,300		400		30	29	30						1,000		300	35	0	1,000			100	0
17	5,000		280		17	28	30						500		250	35	2	1,000			100	0
18	4,740		490		25	32	35						1,000		200	30	11	1,000			100	0
19	4,500		500		45	29	27						1,300		700	25	5	1,000			100	0
20	4,670		230		32	25	26						1,500		400	20	4	1,000			100	0
21	4,670		145		22	33	33						1,300		400	15	3	1,000			100	0
22	4,620																					
23	4,660		70		18	35	33						500		300	15	2	1,000			100	0
24	4,680		42		12	31	33						2,000		800	10	3	1,000			100	0
25	4,700		120		14	34	33						1,500		700	20	0	1,000			100	0
26	4,680		100		14	32	33						700		300	15	1	1,000			10	0
27	4,530		125		28	32	34						1,000		400	10	1	1,000			100	0
28	4,480		95		18	29	30						4,000		500	7	3	1,000			10	0
29	4,300																					
30	4,100		320		24	34	33						800		300	5	2	1,000			10	0
31	4,300		300		14	33	35						1,000		400	6	1	1,000			100	0
Mean	4,603		224		20	31	31						1,392		448	18	2.9	1,000			86	0.2

August, 1923																						
1	4,500		310		12	34	36						5,000		600	10	1	1,000			100	0
2	4,460		460		24	34	35						1,500		500	10	2	1,000			10	0
3	4,400		275		20	25	26						2,000		600	12	3	1,000			100	0
4	4,650		250		24	32	31						5,000		2,000	15	3	1,000			10	0
5	4,660																					
6	4,540		500		32	22	24						2,000		700	16	0	1,000			100	4
7	4,300		600		12	24	24						4,000		500	20	2	1,000			10	0
8	4,520		370		20	30	31						3,000		700	10	1	1,000			100	0
9	4,680		500		25	30	30						5,000		1,000	20	1	1,000			100	0
10	4,550		825		25	30	31						7,000		1,500	30	0	1,000			100	4
11	4,351		740		60	27	29						9,000		1,200	60	2	1,000			100	4
12	4,460																					
13	4,530		2,000		30	25	26						4,000		1,000	40	4	1,000			100	0
14	4,520		1,200		20								6,000		1,200	60	6	1,000			100	0
15	4,490																					
16	4,420																					
17	4,560		400		16								3,000		1,800	30	1	1,000			100	0
18	4,740		250		22								6,000		1,500	50	4	1,000			100	0
19	4,660																					
20	4,600		450		14	30	31						1,000		200	10	2	1,000			10	0
21	4,600		125		55	30	30						2,000		1,000	30	3	1,000			100	0
22	4,520		225		14	27	28						5,000		2,000	60	2	1,000			100	0
23	4,600		85		10	28	28						4,000		1,500	75	0	1,000			100	0
24	4,480		75		12	36	33						400		250	30	1	1,000			100	0
25	4,480		50		8	29	31						600		350	10	5	1,000			10	0
26	4,400																					
27	4,400		32		17	31	34						1,500		400	15	0	1,000			100	0
28	4,400		30		8	32	35						2,000		600	35	1	1,000			100	0
29	4,300		355		30	30	33						1,700		800	20	5	1,000			100	0
30	4,340		55		17	37	37						2,500		1,200	50	1	1,000			100	2
31	4,350		30		7	36	39						3,000		600	50	3	1,000			100	0
Mean	4,499		408		21	30	31						3,448		948	31	2.1	1,000			82	0.6
Sept., 1923																						
1	4,400		35		22	42	42						4,000		1,000	50	7	1,000			100	0
2	4,400																					
3	4,370		30		7	38	38						3,000		800	10	2	1,000			10	0
4	4,360		40		7	38	38						1,000		500	25	2	1,000			10	0
5	4,370		50		13	36	36						1,500		700	35	0	1,000			10	0
6	4,350		45		7	42	41						7,000		2,500	50	1	1,000			100	0
7	4,350		65		22	39	36						3,000		800	40	3	1,000			100	0
8	4,500		50		11	36	40						4,000		1,500	50	3	1,000			100	0
9	4,500																					
10	4,430		70		10	47	48						1,000		500	25	0	1,000			100	0
11	4,360		60		8	49	51						700		250	7	2	1,000			100	0
12	4,630		75		10	49	51						(1)		400	25	4	1,000			100	0
13	4,740		45		11	47	49						1,500		700	7	1	1,000			100	2

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[1] Spreader.

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923–24—Continued

HUNTINGTON (W. VA.) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Sept., 1923	*1,000 gallons*	*° C.*																				
14	4,820	-------	50	------	14	47	50	-------	-------	-------	-------	-------	1,000	-------	500	30	4	1,000	-------	-------	100	0
15	4,700	-------	40	------	10	46	49	-------	-------	-------	-------	-------	3,000	-------	1,000	50	2	1,000	-------	-------	100	0
16	4,300	-------																				
17	4,100	-------	35	------	8	48	50	-------	-------	-------	-------	-------	4,000	-------	1,500	35	3	1,000	-------	-------	100	0
18	4,400	-------	35	------	9	47	49	-------	-------	-------	-------	-------	2,000	-------	1,000	75	3	1,000	-------	-------	10	0
19	4,000	-------	33	------	10	38	40	-------	-------	-------	-------	-------	1,000	-------	500	10	3	1,000	-------	-------	0	0
20	4,350	-------	35	------	15	42	45	-------	-------	-------	-------	-------	1,500	-------	1,000	40	2	1,000	-------	-------	100	0
21	4,340	-------	40	------	14	43	43	-------	-------	-------	-------	-------	5,000	-------	2,000	50	3	1,000	-------	-------	100	0
22	4,410	-------	180	------	32	38	42	-------	-------	-------	-------	-------	4,000	-------	1,500	20	2	1,000	-------	-------	100	0
23	4,400	-------																				
24	4,570	-------	120	------	24	39	46	-------	-------	-------	-------	-------	1,200	-------	400	15	1	1,000	-------	-------	100	0
25	4,580	-------	160	------	35	34	37	-------	-------	-------	-------	-------	1,000	-------	300	5	0	1,000	-------	-------	0	0
26	3,500	-------	60	------	13	40	44	-------	-------	-------	-------	-------	500	-------	150	3	1	1,000	-------	-------	0	0
27	4,650	-------	45	------	14	40	44	-------	-------	-------	-------	-------	700	-------	300	15	0	1,000	-------	-------	100	0
28	4,590	-------	40	------	23	43	43	-------	-------	-------	-------	-------	1,000	-------	300	5	0	1,000	-------	-------	100	0
29	4,470	-------	35	------	14	42	47	-------	-------	-------	-------	-------	10,000	-------	4,000	80	3	1,000	-------	-------	0	0
30	4,530	-------	------	------	------	-----	------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
Mean	4,416	-------	59	------	14	42	44	-------	-------	-------	-------	-------	2,608	-------	964	30	2.1	1,000	-------	-------	70	0.08
Oct., 1923																						
1	4,600	-------	40	------	15	40	43	-------	-------	-------	-------	-------	1,000	-------	400	8	0	1,000	-------	-------	100	0
2	4,610	-------	19	------	14	43	47	-------	-------	-------	-------	-------	500	-------	250	20	5	1,000	-------	-------	100	6
3	4,730	-------	21	------	13	40	45	-------	-------	-------	-------	-------	400	-------	200	15	3	1,000	-------	-------	100	0
4	4,630	-------	60	------	25	44	45	-------	-------	-------	-------	-------	3,000	-------	1,000	15	2	1,000	-------	-------	100	0
5	4,530	-------	18	------	11	38	40	-------	-------	-------	-------	-------	700	-------	300	12	5	1,000	-------	-------	100	0
6	4,410	-------	20	------	12	42	42	-------	-------	-------	-------	-------	1,500	-------	500	10	0	1,000	-------	-------	100	0
7	4,430	-------																				
8	4,360	-------	30	------	10	42	44	-------	-------	-------	-------	-------	300	-------	150	5	0	100	-------	-------	0	0
9	4,370	-------	20	------	8	41	43	-------	-------	-------	-------	-------	200	-------	50	2	0	10	-------	-------	0	0
10	4,400	-------	18	------	7	46	48	-------	-------	-------	-------	-------	150	-------	20	2	0	100	-------	-------	0	0
11	4,280	-------	20	------	8	46	49	-------	-------	-------	-------	-------	150	-------	50	2	1	10	-------	-------	0	0

12	3,800	------	20	------	7	48	52	------	------	------	------	------	75	------	10	0	0	10	------	------	0	0
13	3,900	------	19	------	6	49	52	------	------	------	------	------	85	------	35	2	2	10	------	------	0	0
14	3,910																					
15	3,860	------	19	------	8	47	49	------	------	------	------	------	500	------	200	5	1	100	------	------	100	0
16	3,800	------	20	------	7	45	48	------	------	------	------	------	150	------	50	3	1	100	------	------	10	0
17	4,550	------	18	------	7	43	47	------	------	------	------	------	600	------	250	10	0	1,000	------	------	100	0
18	4,441	------	18	------	6	45	47	------	------	------	------	------	150	------	50	3	0	1,000	------	------	0	0
19	4,360	------	25	------	8	44	47	------	------	------	------	------	100	------	50	2	1	10	------	------	0	0
20	4,300	------	20	------	6	48	50	------	------	------	------	------	200	------	100	5	1	10	------	------	0	0
21	3,900																					
22	3,870	------	18	------	9	41	47	------	------	------	------	------	100	------	50	5	1	10	------	------	0	0
23	3,900	------	20	------	9	43	49	------	------	------	------	------	75	------	35	2	0	10	------	------	0	0
24	3,970	------	22	------	8	41	47	------	------	------	------	------	200	------	100	0	0	10	------	------	0	0
25	4,100	------	20	------	7	40	46	------	------	------	------	------	100	------	10	1	1	100	------	------	0	0
26	4,100	------	20	------	7	41	45	------	------	------	------	------	300	------	100	15	1	1,000	------	------	100	0
27	4,100	------	18	------	5	40	44	------	------	------	------	------	1,000	------	300	15	2	1,000	------	------	100	0
28	4,050																					
29	4,040	------	24	------	7	44	48	------	------	------	------	------	2,500	------	700	20	0	1,000	------	------	10	0
30	4,000	------	25	------	11	40	44	------	------	------	------	------	700	------	300	10	3	1,000	------	------	100	0
31	4,000	------	22	------	8	40	44	------	------	------	------	------	4,000	------	2,000	35	4	1,000	------	------	100	0
Mean	4,200	------	23	------	9	43	46	------	------	------	------	------	694	------	269	8	1.3	503	------	------	45	0.2
Nov., 1923																						
1	4,000	------	20	------	5	35	40	------	------	------	------	------	2,000	------	1,000	50	3	1,000	------	------	100	0
2	4,000	------	30	------	6	40	45	------	------	------	------	------	700	------	400	35	1	1,000	------	------	10	0
3	4,000	------	25	------	10	38	41	------	------	------	------	------	1,000	------	700	15	1	1,000	------	------	0	0
4	4,000																					
5	3,940	------	21	------	7	34	40	------	------	------	------	------	1,500	------	500	10	3	1,000	------	------	100	0
6	3,900	------	32	------	10	40	46	------	------	------	------	------	1,700	------	500	35	2	1,000	------	------	100	0
7	3,800	------	110	------	20	44	49	------	------	------	------	------	7,000	------	3,000	60	3	1,000	------	------	100	0
8	3,800	------	145	------	24	43	49	------	------	------	------	------	1,800	------	400	15	2	1,000	------	------	100	0
9	3,870	------	225	------	25	45	50	------	------	------	------	------	2,500	------	600	15	2	1,000	------	------	100	0
10	3,670	------	175	------	17	30	38	------	------	------	------	------	5,000	------	2,500	40	2	1,000	------	------	0	0
11	3,740																					
12	3,800	------	73	------	15	30	31	------	------	------	------	------	1,500	------	400	20	0	1,000	------	------	10	0
13	3,860	------	70	------	12	27	31	------	------	------	------	------	600	------	350	25	1	1,000	------	------	100	0
14	3,770	------	48	------	17	27	30	------	------	------	------	------	1,200	------	300	10	1	1,000	------	------	10	0
15	3,880	------	45	------	15	25	31	------	------	------	------	------	1,500	------	500	20	3	1,000	------	------	100	0
16	3,850	------	32	------	10	29	33	------	------	------	------	------	1,500	------	700	25	2	1,000	------	------	100	0
17	3,830	------	30	------	11	27	30	------	------	------	------	------	2,500	------	1,000	40	3	1,000	------	------	10	0
18	3,750																					
19	3,720	------	35	------	12	28	33	------	------	------	------	------	750	------	300	20	0	1,000	------	------	100	0
20	3,800	------	30	------	10	31	32	------	------	------	------	------	500	------	200	7	1	1,000	------	------	10	0
21	3,878	------	27	------	13	36	37	------	------	------	------	------	400	------	250	10	1	1,000	------	------	100	0
22	4,200	------	35	------	13	36	38	------	------	------	------	------	800	------	300	6	0	1,000	------	------	100	0
23	4,150	------	33	------	8	36	44	------	------	------	------	------	800	------	150	9	1	1,000	------	------	100	0
24	4,080	------	40	------	12	37	43	------	------	------	------	------	1,000	------	500	30	0	1,000	------	------	100	0
25	3,800																					
26	3,470	------	38	------	11	37	42	------	------	------	------	------	750	------	200	7	2	100	------	------	100	8
27	3,830	------	105	------	20	36	41	------	------	------	------	------	1,200	------	300	20	0	1,000	------	------	10	4

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923–24—Continued

HUNTINGTON (W. VA.) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Nov., 1923	*1,000 gallons*	° *C.*																				
28	3,820	------	95	------	18	33	37	------	------	------	------	------	2,000	------	800	25	4	1,000	------	------	100	8
29	3,800	------	110	------	20	34	39	------	------	------	------	------	2,200	------	1,000	15	1	1,000	------	------	100	0
30	3,840	------	130	------	15	27	35	------	------	------	------	------	300	------	150	5	0	1,000	------	------	10	0
Mean	3,863	------	68		14	34	39	------	------	------	------	------	1,642	------	654	22	1.5	965	------	------	68	0.7
Dec., 1923																						
1	3,800	------	125	------	16	33	38	------	------	------	------	------	1,000	------	400	35	3	1,000	------	------	100	10
2	3,650	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
3	3,620	------	480	------	18	35	42	------	------	------	------	------	1,500	------	800	20	3	1,000	------	------	10	10
4	3,600	------	420	------	20	28	34	------	------	------	------	------	2,500	------	1,300	50	3	1,000	------	------	100	10
5	3,740	------	470	------	19	28	36	------	------	------	------	------	1,500	------	350	20	2	1,000	------	------	100	0
6	3,900	------	700	------	25	30	37	------	------	------	------	------	4,000	------	1,000	50	5	1,000	------	------	100	0
7	3,920	------	700	------	60	20	24	------	------	------	------	------	3,000	------	1,200	40	0	1,000	------	------	100	4
8	3,900	------	340	------	11	25	20	------	------	------	------	------	1,000	------	200	8	0	1,000	------	------	100	0
9	3,900	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
10	3,860	------	510	------	18	20	27	------	------	------	------	------	1,700	------	200	8	0	1,000	------	------	10	0
11	3,860	------	420	------	15	20	23	------	------	------	------	------	2,500	------	350	20	0	1,000	------	------	10	0
12	3,860	------	410	------	16	24	24	------	------	------	------	------	2,000	------	200	12	0	1,000	------	------	10	0
13	3,900	------	270	------	13	24	27	------	------	------	------	------	900	------	175	15	1	100	------	------	100	0
14	3,360	------	250	------	20	20	23	------	------	------	------	------	1,200	------	400	25	3	1,000	------	------	10	0
15	3,950	------	240	------	10	17	22	------	------	------	------	------	5,000	------	2,000	35	0	1,000	------	------	100	0
16	3,620	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
17	4,000	------	200	------	12	22	19	------	------	------	------	------	3,500	------	1,200	40	2	1,000	------	------	100	0
18	4,670	------	215	------	14	15	17	------	------	------	------	------	2,500	------	400	4	1	1,000	------	------	0	0
19	4,900	------	165	------	16	19	20	------	------	------	------	------	1,500	------	350	5	2	1,000	------	------	10	0
20	4,450	------	150	------	13	23	19	------	------	------	------	------	1,000	------	200	0	0	1,000	------	------	0	0
21	3,880	------	170	------	10	16	20	------	------	------	------	------	1,200	------	300	7	2	1,000	------	------	0	0
22	3,800	------	120	------	18	20	25	------	------	------	------	------	4,000	------	1,500	45	1	1,000	------	------	0	0
23	3,580	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
24	3,700	------	305	------	14	18	19	------	------	------	------	------	2,500	------	400	35	1	100	------	------	10	0
25	3,550	------	------	------	------	------	23	------	------	------	------	------	------	------	------	------	------	------	------	------	------	0
26	3,340	------	330	------	17	25	27	------	------	------	------	------	2,000	------	500	20	2	10,000	------	------	100	0

27	3,500		260		15	15	19						1,000		400	15	2	10,000			0	0
28	3,640		300		20	20	21						2,500		350	0	0	10,000			0	0
29	3,700		280		19	18	21						5,000		2,000	60	4	10,000			100	0
30	3,720																					
31	3,700		220		22	19	20						2,500		600	6	0	1,000			10	0
Mean	3,825		322		18	22	25						2,280		671	23	1.5	2,370			47	1.3
Jan., 1924																						
1	3,720		410		20	12	16						3,000		400	7	0	1,000			0	0
2	3,700		450		25	14	16						5,000		600	30	3	10,000			10	0
3	3,650		450		24	11	16						2,500		200	10	2	10,000			10	0
4	3,650		300		22	11	15						1,500		400	12	2	10,000			0	0
5	3,760		350		20	10	15						5,000		2,000	60	2	1,000			0	0
6	4,160																					
7	4,180		320		14	7	12						2,500		175	8	2	10,000			0	0
8	4,300		250		21	11	14						1,000		400	4	1	10,000			0	0
9	4,400		220		18	12	15						1,200		300	7	1	1,000			0	0
10	4,300		225		16	12	19						1,000		300	5	2	1,000			0	0
11	4,300		900		13	11	16						3,000		900	3	0	1,000			10	0
12	4,260		480		19	12	14						5,000		2,000	60	4	10,000			100	0
13	4,320																					
14	4,320		480		25	13	17						4,000		1,500	70	2	1,000			10	0
15	4,250		360		17	16	19						2,000		100	8	0	1,000			10	2
16	4,400		270		16	9	13						1,500		300	4	2	10,000			0	0
17	4,400		360		14	9	13						800		100	0	0	10,000			0	0
18	4,360		450		16	9	14						750		75	5	2	1,000			10	0
19	4,300		660		14	11	15						7,000		3,000	55	4	1,000			10	4
20	3,870																					
21	3,900		280		16	10	14						2,500		500	15	0	1,000			0	0
22	4,360		240		18	9	15						4,000		2,000	6	0	10,000			0	0
23	4,600		450		10	12	17						800		200	5	0	1,000			0	0
24	4,300		400		23	13	17						300		100	3	0	10,000			10	0
25	4,440		130		11	15	18						150		50	5	0	1,000			10	0
26	4,400												1,500		300	12	2	10,000			100	4
27	4,400																					
28	4,500		80		10	15	19						700		200	10	2	10,000			100	0
29	4,500		58		8	16	19						800		275	13	2	10,000			100	8
30	4,500		55		10	14	18						750		400	12	2	100			100	0
31	4,400		50		11	15	19						500		225	5	1	1,000			10	8
Mean	4,220		334		17	12	16						2,180		630	16	1.4	5,300			22	1
Feb., 1924																						
1	3,740		50		9	16	20						300		125	4	1	1,000			10	8
2	4,560		45		10	17	22						800		300	7	2	1,000			10	10
3	4,500																					
4	4,340		45		12	17	21						700		150	15	3	1,000			10	10
5	4,160		45		11	19	26						1,300		150	6	2	10,000			10	10
6	4,146		50		13	21	23						1,000		400	3	2	100			10	0
7	4,142		150		15	18	22						1,300		350	15	4	10,000			10	0
8	4,351		140		18	16	22						800		200	4	1	1,000			10	0

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923–24—Continued

HUNTINGTON (W. VA.) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Feb., 1923	*1,000 gallons*	*° C.*																				
9	4,351		210		20	21	26						1,300		800	7	2	1,000			0	0
10	3,629																					
11	4,161		100		15	18	20						300		85	2	1	1,000			0	0
12	4,104		90		12	19	25						300		100	5	2	1,000			0	0
13	4,161		80		13	20	24						700		225	13	6	1,000			100	0
14	4,256		70		11	22	27						700		200	4	1	1,000			0	0
15	4,332		70		9	22	25						500		250	3	1	1,000			0	0
16	4,426		50		10	22	24						1,500		800	15	2	1,000			100	0
17	4,100																					
18	4,100		140		15	18	22						1,800		700	15	4	10,000			0	0
19	4,200		220		17	18	22						1,000		400	8	2	10,000			10	0
20	4,000		840		20	20	22						1,200		350	5	1	1,000			0	0
21	3,800		625		18	15	17						4,000		250	4	1	1,000			0	0
22	4,270		550		21	11	15						1,700		500	15	2	100			0	0
23	4,200		390		15	15	18						5,000		1,000	35	4	1,000			0	0
24	4,230																					
25	4,100		155		25	10	14						1,200		150	6	0	1,000			0	0
26	4,100		170		17	12	17						750		100	4	0	1,000			0	0
27	4,060		125		13	11	16						700		300	17	5	100			10	0
28	3,950		100		14	15	17						500		125	6	3	1,000			10	0
29	4,160		85		12	14	14						500		250	3	2	1,000			10	0
Mean	4,160		184		15	17	21						1,190		330	8.8	2.2	2,330			12	1.5
March, 1924																						
1	4,150		100		14	16	15						1,300		750	8	2	1,000			0	0
2	4,250																					
3	3,715		65		12	20	20						750		125	5	3	10,000			100	0
4	4,049		115		23	30	30						200		100	7	2	100			100	0
5	4,530		90		22	24	27						150		60	3	1	10,000			0	0
6	4,250		85		20	30	30						200		80	3	1	1,000			10	0
7	4,430		75		18	27	30						150		75	6	1	1,000			10	0

8	4,100	......	675	......	25	26	29	......	......	......	......	......	3,000	......	1,000	50	3	1,000	......	......	10	0
9	3,550																					
10	3,570	......	250	......	13	23	29	......	......	......	......	......	2,500	......	1,500	35	2	10,000	......	......	10	0
11	4,030	......	180	......	25	24	28	......	......	......	......	......	1,800	......	800	40	4	1,000	......	......	100	0
12	3,720	......	125	......	20	23	28	......	......	......	......	......	750	......	150	8	2	1,000	......	......	10	2
13	4,030	......	100	......	11	20	26	......	......	......	......	......	900	......	80	3	0	1,000	......	......	0	0
14	3,672	......	90	......	12	23	26	......	......	......	......	......	300	......	60	7	2	1,000	......	......	100	0
15	4,351	......	110	......	15	27	32	......	......	......	......	......	2,500	......	1,000	30	2	1,000	......	......	100	0
16	4,541																					
17	4,237	......	90	......	11	30	30	......	......	......	......	......	500	......	150	4	0	1,000	......	......	10	0
18	4,124	......	85	......	12	31	35	......	......	......	......	......	150	......	40	2	0	1,000	......	......	10	0
19	3,871	......	85	......	13	30	35	......	......	......	......	......	200	......	50	3	0	1,000	......	......	10	0
20	4,522	......	80	......	10	31	33	......	......	......	......	......	125	......	60	1	0	100	......	......	0	0
21	2,900	......	110	......	17	31	34	......	......	......	......	......	1,500	......	700	20	3	1,000	......	......	100	0
22	3,270	......	480	......	25	29	33	......	......	......	......	......	1,200	......	600	10	2	100	......	......	10	0
23	3,850																					
24	3,830	......	200	......	17	26	29	......	......	......	......	......	900	......	350	12	1	100	......	......	100	0
25	3,850	......	100	......	12	31	32	......	......	......	......	......	200	......	100	2	0	1,000	......	......	10	4
26	3,800	......	80	......	10	30	35	......	......	......	......	......	500	......	125	2	2	10,000	......	......	10	0
27	3,830	......	75	......	12	29	33	......	......	......	......	......	600	......	150	12	2	10,000	......	......	10	0
28	3,840	......	75	......	10	29	32	......	......	......	......	......	300	......	70	8	1	1,000	......	......	10	0
29	3,800	......	130	......	16	28	30	......	......	......	......	......	1,200	......	500	15	1	1,000	......	......	10	0
30	3,740																					
31	3,760	......	1,200	......	45	29	33	......	......	......	......	......	2,500	......	500	15	5	1,000	......	......	100	6
Mean	3,941	......	187	......	17	27	30	......	......	......	......	......	938	......	353	12	1.6	2,250	......	......	36	0.46
April, 1924																						
1	3,860	......	860	......	25	20	23	......	......	......	......	......	2,000	......	600	10	2	10,000	......	......	10	0
2	3,760	......	650	......	27	21	23	......	......	......	......	......	1,200	......	150	7	2	1,000	......	......	10	0
3	3,762	......	480	......	20	20	22	......	......	......	......	......	2,000	......	300	7	3	1,000	......	......	0	0
4	3,900	......	280	......	18	18	22	......	......	......	......	......	2,200	......	400	10	3	10,000	......	......	10	0
5	3,740	......	200	......	14	22	24	......	......	......	......	......	3,000	......	1,000	25	4	1,000	......	......	10	4
6	3,880																					
7	3,820	......	140	......	14	25	29	......	......	......	......	......	1,000	......	200	5	1	1,000	......	......	100	0
8	3,800	......	125	......	9	25	29	......	......	......	......	......	500	......	50	3	1	1,000	......	......	10	4
9	3,820	......	85	......	10	26	30	......	......	......	......	......	150	......	40	1	0	1,000	......	......	10	0
10	3,600	......	80	......	10	25	29	......	......	......	......	......	200	......	75	1	1	1,000	......	......	10	0
11	3,700	......	75	......	8	24	29	......	......	......	......	......	300	......	50	2	0	10,000	......	......	10	0
12	3,700	......	70	......	8	23	26	......	......	......	......	......	500	......	125	3	0	10,000	......	......	10	0
13	3,670																					
14	4,070	......	70	......	10	24	28	......	......	......	......	......	300	......	175	7	0	1,000	......	......	10	8
15	3,600	......	60	......	8	25	28	......	......	......	......	......	75	......	25	2	0	1,000	......	......	10	0
16	3,900	......	85	......	8	26	30	......	......	......	......	......	150	......	60	2	0	100	......	......	100	0
17	4,200	......	60	......	10	29	33	......	......	......	......	......	175	......	100	1	1	1,000	......	......	100	0
18	4,400	......	100	......	10	30	31	......	......	......	......	......	250	......	80	3	2	1,000	......	......	100	0
19	4,040	......	115	......	8	30	34	......	......	......	......	......	2,000	......	700	10	0	1,000	......	......	100	0
20	3,560																					
21	3,600	......	125	......	11	35	37	......	......	......	......	......	300	......	60	3	2	1,000	......	......	100	0
22	3,700	......	100	......	12	35	38	......	......	......	......	......	200	......	50	3	1	1,000	......	......	100	0
23	4,040	......	95	......	10	33	36	......	......	......	......	......	200	......	100	2	0	1,000	......	......	100	0
24	4,160	......	80	......	13	31	36	......	......	......	......	......	300	......	200	10	1	1,000	......	......	100	0

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923–24—Continued

HUNTINGTON (W. VA.) WATER FILTRATION PLANT—Continued.

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
April, 1924	*1,000 gallons*	*° C.*																				
25	4,000	......	90	......	12	28	35	......	......	......	......	......	50	......	10	1	0	10,000	......	......	100	0
26	4,100	......	85	......	12	29	34	......	......	......	......	......	1,000	......	600	20	3	1,000	......	......	0	0
27	4,100	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
28	4,100	......	90	......	14	28	29	......	......	......	......	......	100	......	25	0	0	1,000	......	......	0	0
29	4,000	......	70	......	10	28	29	......	......	......	......	......	225	......	75	3	0	1,000	......	......	10	0
30	3,900	......	110	......	12	30	31	......	......	......	......	......	400	......	125	2	0	100	......	......	10	0
Mean	3,883	......	168	......	12	27	30	......	......	......	......	......	722	......	207	5.5	1	2,660	......	......	43	0.61
May, 1924																						
1	3,900	......	340	......	18	29	32	......	......	......	......	......	2,500	......	150	6	0	1,000	......	......	100	0
2	3,800	......	280	......	14	29	33	......	......	......	......	......	500	......	100	0	0	1,000	......	......	10	0
3	3,900	......	270	......	15	33	34	......	......	......	......	......	1,100	......	250	15	0	10,000	......	......	10	0
4	3,800	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
5	3,800	......	150	......	15	26	30	......	......	......	......	......	800	......	75	3	1	1,000	......	......	10	0
6	3,840	......	125	......	13	25	29	......	......	......	......	......	700	......	100	3	0	10,000	......	......	10	0
7	3,960	......	100	......	15	27	29	......	......	......	......	......	300	......	75	7	2	100	......	......	100	0
8	4,000	......	100	......	17	25	29	......	......	......	......	......	750	......	80	0	1	100	......	......	10	0
9	3,960	......	90	......	11	31	31	......	......	......	......	......	500	......	60	4	2	1,000	......	......	0	0
10	3,950	......	80	......	14	28	32	......	......	......	......	......	1,200	......	500	15	2	1,000	......	......	0	0
11	3,820	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
12	3,760	......	100	......	12	30	32	......	......	......	......	......	700	......	60	2	0	1,000	......	......	10	0
13	3,580	......	225	......	15	21	23	......	......	......	......	......	2,000	......	400	4	0	1,000	......	......	10	0
14	4,060	......	300	......	35	22	25	......	......	......	......	......	2,500	......	600	20	4	1,000	......	......	10	0
15	4,330	......	260	......	23	19	23	......	......	......	......	......	3,000	......	1,000	30	3	1,000	......	......	100	0
16	4,450	......	230	......	12	16	19	......	......	......	......	......	4,000	......	800	12	0	1,000	......	......	100	0
17	4,476	......	225	......	8	18	22	......	......	......	......	......	2,500	......	700	20	0	10,000	......	......	10	0
18	4,380	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
19	4,090	......	120	......	15	21	25	......	......	......	......	......	1,000	......	150	7	2	10,000	......	......	10	0
20	3,870	......	125	......	16	20	25	......	......	......	......	......	2,000	......	650	3	0	10,000	......	......	10	0

21	3,590		110		10	25	26						750		75	2	0	1,000			10	0
22	3,638		100		8	26	27						500		100	7	0	1,000			10	0
23	4,081		160		6	20	23						800		20	2	0	10,000			10	0
24	4,392		100		8	21	23						5,000		1,000	17	0	1,000			10	0
25	4,575																					
26	4,331		90		10	21	23						1,500		150	1	0	1,000			100	0
27	4,285		90		7	20	24						500		60	0	0	1,000			10	0
28	3,680		80		10	22	25						200		25	2	0	100			100	0
29	3,470		160		12	20	22						800		200	3	1	1,000			10	0
30	3,650																					
31	3,640		300		18	29	32						1,500		200	6	1	10,000			10	0
Mean	3,971		166		14	24	27						1,450		292	7.3	0.73	3,320			30	0
June, 1924																						
1	3,720																					
2	3,640		200		15	17	20						750		150	3	1	10,000			10	0
3	3,450		150		14	26	28						600		100	2	0	1,000			10	0
4	3,670		100		12	29	28						200		50	1	0	10,000			10	0
5	4,000		90		13	28	30						150		40	1	0	1,000			0	0
6	3,960		90		12	27	30						125		40	2	1	1,000			10	2
7	4,340		85		8	30	33						154		24	3	0	100			0	0
8	4,600																					
9	4,000		100		10	28	32						94		40	3	1	1,000			10	2
10	3,700		300		15	35	35						116		24	2	0	1,000			10	0
11	3,530		600		15	35	34						700		120	3	2	1,000			100	0
12	3,700		800		20	30	29						1,100		116	4	2	1,000			10	0
13	4,000		700		20	28	27						630		28	1	1	1,000			10	0
14	4,080		350		20	28	26						168		42	4	2	10			0	0
15	4,120																					
16	4,300		450		20	30	28						480		115	4	2	1,000			100	0
17	3,900		280		15	27	29						240		60	1	1	1,000			100	0
18	3,900		200		15	32	34						150		40	0	0	100			0	0
19	4,050		200		15	27	30						65		30	1	1	1,000			10	0
20	4,090		150		10	32	32						70		15	0	0	1,000			10	0
21	4,700		100		10	30	31						110			0	0	100			0	0
22	4,740																					
23	4,570		150		15	41	42						125		15	1	0	1,000			10	0
24	4,200		350		20	36	38						700		75	0	0	10,000			10	0
25	4,700		120		15	37	35						80		20	0	0	1,000			0	0
26	4,700		100		10	42	41						75		15	0	0	10			10	0
27	4,500		115		13	41	44						100		25	1	0	1,000			10	0
28	4,600		220		12	44	43						800		200	5	2	10,000			100	0
29	4,200																					
30	4,300		1,750		25	37	32						6,000		2,500	100	2	10,000			100	0
Mean	4,132		310		15	32	32						551		155	5.7	0.72	2,610			26	0.16

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923–24—Continued

ASHLAND (KY.) WATER FILTRATION PLANT

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
July, 1923	*1,000 gallons*	*° C.*																				
1	1,066	------	150	------	------	14	------	------	------	------	------	------	504	35	------	5	2	100	100	------	10	0
2	1,234	------	100	------	------	15	------	------	------	------	------	------	252	22	------	8	1	100	100	------	0	0
3	1,075	------	80	------	------	16	------	------	------	------	------	------	504	54	------	2	0	100	100	------	10	0
4	1,130	------	80	------	------	14	------	------	------	------	------	------	825	105	------	1	1	100	100	------	0	0
5	1,225	------	90	------	------	15	------	------	------	------	------	------	750	250	------	37	0	100	100	------	10	0
6	1,169	------	60	------	------	15	------	------	------	------	------	------	829	160	------	6	0	100	100	------	10	0
7	1,148	------	90	------	------	15	------	------	------	------	------	------	678	180	------	18	0	100	100	------	0	0
8	1,103	------	100	------	------	14	------	------	------	------	------	------	736	125	------	0	0	100	100	------	10	0
9	1,214	------	150	------	------	16	------	------	------	------	------	------	396	97	------	0	0	100	100	------	0	10
10	1,249	------	375	------	------	15	------	------	------	------	------	------	375	53	------	5	4	100	100	------	0	0
11	1,242	------	500	------	------	19	------	------	------	------	------	------	255	122	------	24	0	100	100	------	0	0
12	1,250	------	550	------	------	16	------	------	------	------	------	------	410	150	------	15	5	100	100	------	0	0
13	1,249	------	2,400	------	------	15	------	------	------	------	------	------	795	226	------	2	1	100	100	------	0	0
14	1,133	------	2,000	------	------	19	------	------	------	------	------	------	545	105	------	1	1	100	100	------	0	0
15	1,148	------	1,500	------	------	22	------	------	------	------	------	------	605	56	------	2	0	100	100	------	0	0
16	1,189	------	900	------	------	24	------	------	------	------	------	------	195	5	------	6	0	100	100	------	0	0
17	1,251	------	500	------	------	19	------	------	------	------	------	------	395	35	------	1	0	100	100	------	0	0
18	1,194	------	500	------	------	22	------	------	------	------	------	------	452	18	------	0	0	100	100	------	0	0
19	1,285	------	350	------	------	20	------	------	------	------	------	------	253	65	------	6	0	100	100	------	0	0
20	1,347	------	350	------	------	19	------	------	------	------	------	------	295	25	------	0	0	100	100	------	0	0
21	1,295	------	250	------	------	16	------	------	------	------	------	------	185	95	------	6	0	100	100	------	0	0
22	1,238	------	180	------	------	13	------	------	------	------	------	------	315	45	------	6	0	100	100	------	10	0
23	1,385	------	100	------	------	12	------	------	------	------	------	------	255	50	------	0	0	100	100	------	0	0
24	1,232	------	250	------	------	13	------	------	------	------	------	------	380	125	------	6	0	100	100	------	0	0
25	1,342	------	180	------	------	13	------	------	------	------	------	------	285	67	------	3	0	100	100	------	10	0
26	1,151	------	80	------	------	14	------	------	------	------	------	------	315	84	------	2	0	100	100	------	0	0
27	1,235	------	100	------	------	11	------	------	------	------	------	------	255	95	------	0	0	100	100	------	0	0
28	1,164	------	80	------	------	13	------	------	------	------	------	------	410	55	------	0	1	100	100	------	0	0
29	1,050	------	1,400	------	------	11	------	------	------	------	------	------	380	125	------	0	2	100	100	------	0	0
30	1,255	------	1,200	------	------	9	------	------	------	------	------	------	380	35	------	0	0	100	100	------	0	0
31	1,284	------	700	------	------	11	------	------	------	------	------	------	315	50	------	0	0	100	100	------	0	0
Mean	1,210	------	432	------	------	15	------	------	------	------	------	------	397	87	------	6	0.6	100	100	------	2.3	0.3

Aug., 1923																						
1	1,247	26	700	......	15	23	20	......	......	......	......	......	315	......	50	0	1	10,000	......	10,000	0	0
2	1,242	26	500	......	14	23	20	......	......	......	......	......	378	......	95	0	0	10,000	......	10,000	0	0
3	1,197	26	425	......	18	26	24	......	......	......	......	......	504	......	120	1	1	1,000	......	10,000	0	0
4	1,299	26	275	......	17	23	22	......	......	......	......	......	520	......	125	0	0	1,000	......	10,000	0	0
5	931	26	260	......	16	23	22	......	......	......	......	......	504	......	90	6	0	1,000	......	10,000	0	0
6	1,240	26	300	......	16	29	28	......	......	......	......	......	378	......	25	5	0	1,000	......	1,000	2	0
7	1,221	26	800	......	17	26	30	......	......	......	......	......	252	......	90	4	0	10,000	......	10,000	4	0
8	1,226	26	700	......	17	26	30	......	......	......	......	......	315	......	45	7	1	10,000	......	10,000	4	0
9	1,605	26	350	......	17	25	28	......	......	......	......	......	365	......	55	3	0	10,000	......	10,000	4	0
10	1,303	26	375	......	20	20	18	......	......	......	......	......	442	......	45	2	0	1,000	......	10,000	2	0
11	1,181	26	400	......	18	20	20	......	......	......	......	......	756	......	120	16	0	1,000	......	10,000	0	0
12	1,021	27	800	......	17	19	16	......	......	......	......	......	315	......	70	22	0	1,000	......	10,000	6	0
13	1,395	26	2,000	......	13	21	20	......	......	......	......	......	378	......	55	16	0	1,000	......	10,000	6	0
14	1,386	25	2,000	......	15	28	30	......	......	......	......	......	504	......	30	4	0	1,000	......	1,000	10	0
15	1,226	24	1,000	......	14	24	20	......	......	......	......	......	315	......	45	10	0	1,000	......	1,000	10	0
16	1,293	24	800	......	18	24	22	......	......	......	......	......	378	......	50	12	1	1,000	......	10	10	0
17	1,139	23	450	......	35	24	20	......	......	......	......	......	365	......	40	2	0	1,000	......	1,000	10	0
18	1,288	24	250	......	35	24	22	......	......	......	......	......	404	......	55	6	2	10,000	......	1,000	10	0
19	1,083	24	180	......	28	26	20	......	......	......	......	......	385	......	200	15	1	10,000	......	1,000	0	0
20	1,334	24	170	......	22	24	30	......	......	......	......	......	505	......	100	4	3	10,000	......	1,000	0	0
21	1,298	24	120	......	13	23	20	......	......	......	......	......	610	......	25	7	1	10,000	......	100	0	0
22	1,176	23	250	......	14	22	16	......	......	......	......	......	800	......	110	4	0	10,000	......	100	0	0
23	1,271	23	130	......	15	21	22	......	......	......	......	......	3,600	......	100	1	0	10,000	......	100	2	0
24	1,236	24	110	......	14	21	22	......	......	......	......	......	2,200	......	20	4	0	10,000	......	100	4	0
25	1,187	24	95	......	14	21	20	......	......	......	......	......	970	......	70	3	0	10,000	......	1,000	2	2
26	1,222	24	90	......	13	23	20	......	......	......	......	......	1,200	......	60	7	0	10,000	......	1,000	6	0
27	1,100	24	70	......	15	25	26	......	......	......	......	......	1,270	......	130	8	0	10,000	......	10,000	0	0
28	1,229	24	70	......	13	22	20	......	......	......	......	......	1,300	......	310	19	0	10,000	......	10,000	8	4
29	1,236	24	250	......	14	20	14	......	......	......	......	......	12,000	......	420	46	1	10,000	......	1,000	0	2
30	1,225	23	200	......	13	20	18	......	......	......	......	......	8,000	......	210	36	0	10,000	......	1,000	4	2
31	1,202	24	110	......	13	20	16	......	......	......	......	......	1,900	......	130	63	0	10,000	......	10,000	10	0
Mean	1,230	24	459	......	17	23	21	......	......	......	......	......	1,350	......	100	12	0.36	6,520	......	5,210	3.7	0.3
Sept., 1923																						
1	1,186	24	50	......	13	44	42	......	......	......	......	......	820	......	204	92	1	10,000	......	10,000	10	0
2	1,138	24	40	......	7	44	42	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
3	1,085	24	35	......	7	42	40	......	......	......	......	......	1,130	......	180	2	0	10,000	......	10,000	10	0
4	1,128	24	35	......	7	39	37	......	......	......	......	......	1,250	......	40	6	0	10,000	......	100	10	0
5	1,165	25	35	......	9	40	38	......	......	......	......	......	3,250	......	(4)	0	0	10,000	......	10,000	10	0
6	1,204	25	80	......	25	40	37	......	......	......	......	......	1,160	......	370	70	0	10,000	......	10,000	10	0
7	1,177	25	140	......	17	38	36	......	......	......	......	......	1,270	......	120	35	0	10,000	......	10,000	10	0
8	1,155	25	90	......	25	37	35	......	......	......	......	......	1,950	......	130	45	0	10,000	......	10,000	10	0
9	1,121	25	55	......	8	37	34	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
10	1,180	25	70	......	25	45	38	......	......	......	......	......	1,290	......	820	13	1	100,000	......	100	10	0
11	1,157	25	50	......	25	53	46	......	......	......	......	......	2,180	......	190	30	1	10,000	......	1,000	10	0
12	1,142	25	65	......	9	57	50	......	......	......	......	......	1,130	......	260	14	0	1,000	......	1,000	10	2
13	1,152	24	45	......	8	50	47	......	......	......	......	......	1,120	......	310	19	0	1,000	......	1,000	10	0

[4] Spoiled.

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923–24—Continued

ASHLAND (KY.) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Sept., 1923	*1,000 gallons*	*° C.*																				
14......	1, 181	23	40	......	7	51	50	......	......	......	......	......	1, 050	......	40	27	0	1, 000	......	1, 000	10	0
15......	1, 145	23	40	......	7	50	46	......	......	......	......	......	1, 300	......	30	25	0	1, 000	......	100	10	0
16......	1, 062	21	40	......	7	50	47	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
17......	1, 163	21	30	......	7	47	44	......	......	......	......	......	710	......	30	50	1	10, 000	......	1, 000	10	0
18......	1, 203	21	30	......	11	38	34	......	......	......	......	......	1, 000	......	50	20	0	1, 000	......	1, 000	10	0
19......	1, 138	21	35	......	24	37	34	......	......	......	......	......	1, 750	......	325	290	2	1, 000	......	1, 000	10	0
20......	1, 376	21	35	......	8	39	34	......	......	......	......	......	1, 880	......	570	230	2	10, 000	......	1, 000	10	0
21......	1, 139	21	40	......	8	38	33	......	......	......	......	......	500	......	480	140	2	10, 000	......	10, 000	10	0
22......	1, 083	22	70	......	15	39	36	......	......	......	......	......	940	......	120	80	5	10, 000	......	10, 000	10	0
23......	1, 073	21	120	......	18	38	36	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
24......	1, 215	22	120	......	22	40	35	......	......	......	......	......	820	......	380	100	5	1, 000	......	1, 000	10	0
25......	1, 184	22	110	......	22	38	30	......	......	......	......	......	1, 500	......	190	180	0	1, 000	......	1, 000	10	0
26......	1, 260	22	140	......	22	38	32	......	......	......	......	......	1, 400	......	110	40	2	10, 000	......	1, 000	10	0
27......	1, 302	22	70	......	8	35	30	......	......	......	......	......	640	......	120	30	0	10, 000	......	1, 000	10	0
28......	1, 202	22	65	......	7	34	39	......	......	......	......	......	470	......	80	20	0	10, 000	......	1, 000	10	0
29......	1, 176	22	70	......	10	34	30	......	......	......	......	......	340	......	20	10	0	1, 000	......	100	10	0
30......	1, 100	22	75	......	10	35	36	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Mean	1, 099	23	61	......	13	43	38	......	......	......	......	......	1, 270	......	215	63	0. 72	10, 400	......	3, 740	10	0. 08
Oct., 1923																						
1......	1, 252	23	120	......	11	39	35	......	......	......	......	......	150	......	20	2	0	1, 000	......	100	10	0
2......	1, 298	22	65	......	10	35	28	......	......	......	......	......	280	......	50	1	0	1, 000	......	100	10	0
3......	1, 596	22	60	......	10	38	30	......	......	......	......	......	850	......	550	0	0	100, 000	......	100	10	0
4......	1, 210	23	95	......	9	40	35	......	......	......	......	......	1, 000	......	40	11	0	1, 000	......	1, 000	10	2
5......	1, 066	23	60	......	9	40	38	......	......	......	......	......	800	......	95	3	0	10, 000	......	100	10	0
6......	1, 032	20	35	......	10	36	29	......	......	......	......	......	550	......	150	12	1	10, 000	......	100	10	0
7......	1, 017	28	22	......	8	38	30	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
8......	1, 186	18	18	......	16	36	31	......	......	......	......	......	800	......	320	18	0	1, 000	......	1, 000	10	0
9......	1, 199	18	18	......	19	39	39	......	......	......	......	......	510	......	60	20	2	1, 000	......	100	10	2
10......	1, 148	18	20	......	16	40	40	......	......	......	......	......	1, 200	......	180	28	8	1, 000	......	100	10	0
11......	1, 237	18	20	......	19	38	37	......	......	......	......	......	820	......	80	12	2	10, 000	......	10, 000	8	2

12......	1,064	18	20	......	8	38	36	......	......	......	......	......	200	......	40	8	0	1,000	......	100	8	0
13......	1,386	18	20	......	10	39	37	......	......	......	......	......	200	......	60	30	2	1,000	......	100	6	0
14......	1,024	17	15	......	7	38	37	......	......	......	......	......										
15......	1,171	17	15	......	10	41	39	......	......	......	......	......	90	......	50	4	0	1,000	......	100	2	0
16......	1,158	17	14	......	7	43	40	......	......	......	......	......	70	......	10	2	1	100	......	10	0	0
17......	1,196	18	14	......	8	51	45	......	......	......	......	......	140	......	10	10	1	100	......	10	0	0
18......	1,219	18	12	......	7	47	40	......	......	......	......	......	80	......	10	1	0	1,000	......	10	0	0
19......	1,299	18	15	......	8	41	40	......	......	......	......	......	110	......	10	0	0	1,000	......	100	0	0
20......	1,261	17	13	......	7	43	40	......	......	......	......	......	170	......	60	1	0	1,000	......	1,000	6	0
21......	1,200	17	14	......	7	43	41	......	......	......	......	......										
22......	1,256	16	14	......	8	42	39	......	......	......	......	......	380	......	30	0	2	10,000	......	100	4	0
23......	1,221	16	14	......	7	41	33	......	......	......	......	......	760	......	170	12	4	10,000	......	100	10	0
24......	1,133	15	15	......	7	41	32	......	......	......	......	......	140	......	120	2	0	10,000	......	1,000	0	0
25......	1,187	14	12	......	7	36	32	......	......	......	......	......	480	......	80	0	0	1,000	......	1,000	0	0
26......	1,150	13	10	......	7	35	31	......	......	......	......	......	950	......	80	3	1	1,000	......	1,000	2	0
27......	1,194	13	10	......	7	36	32	......	......	......	......	......	1,120	......	170	0	0	10,000	......	1,000	0	0
28......	1,103	13	11	......	7	36	33	......	......	......	......	......										
29......	1,218	14	16	......	7	38	34	......	......	......	......	......	440	......	130	3	0	10,000	......	100	10	0
30......	1,225	14	16	......	7	39	34	......	......	......	......	......	650	......	450	31	0	1,000	......	10,000	10	0
31......	1,417	13	18	......	7	40	35	......	......	......	......	......	1,190	......	520	10	5	100,000	......	10,000	10	0
Mean	1,209	18	27	......	9	40	35	......	......	......	......	......	520	......	142	8	1.1	10,900	......	1,420	6.1	0.2
Nov., 1923																						
1......	1,345	13	18	......	7	40	33	......	......	......	......	......	1,920	......	180	15	0	1,000	......	100	10	0
2......	1,428	12	16	......	7	38	34	......	......	......	......	......	630	......	190	18	0	100	......	100	10	0
3......	1,250	12	16	......	7	37	34	......	......	......	......	......	1,300	......	290	7	0	10,000	......	10,000	10	0
4......	1,101	12	16	......	8	38	34	......	......	......	......	......										
5......	1,262	12	22	......	8	41	35	......	......	......	......	......	1,810	......	440	8	0	1,000	......	10,000	10	0
6......	1,282	12	80	......	14	44	35	......	......	......	......	......	1,730	......	180	4	0	1,000	......	1,000	10	0
7......	1,351	12	80	......	13	48	40	......	......	......	......	......	2,770	......	300	21	2	10,000	......	1,000	10	0
8......	1,498	11	215	......	14	52	41	......	......	......	......	......	2,450	......	110	13	1	1,000	......	1,000	10	0
9......	1,497	10	350	......	15	52	46	......	......	......	......	......	1,040	......	40	2	0	10,000	......	1,000	10	0
10......	1,407	9	300	......	16	43	36	......	......	......	......	......	1,630	......	100	16	0	1,000	......	1,000	10	0
11......	1,144	9	160	......	13	35	36	......	......	......	......	......										
12......	1,361	9	80	......	12	42	30	......	......	......	......	......	1,340	......	100	1	0	10,000	......	100	10	0
13......	1,346	8	100	......	17	35	23	......	......	......	......	......	650	......	60	2	0	100	......	100	8	0
14......	1,216	8	100	......	22	33	10	......	......	......	......	......	1,500	......	300	7	0	100	......	100	6	0
15......	1,148	8	90	......	17	28	8	......	......	......	......	......	2,400	......	550	18	0	1,000	......	100	6	0
16......	1,109	8	95	......	15	25	17	......	......	......	......	......	1,810	......	140	3	0	1,000	......	100	4	0
17......	1,099	8	55	......	12	27	15	......	......	......	......	......	1,300	......	80	0	0	1,000	......	100	8	0
18......	922	8	50	......	14	22	12	......	......	......	......	......										
19......	1,147	8	35	......	11	25	13	......	......	......	......	......	560	......	50	3	1	1,000	......	100	0	0
20......	1,200	8	40	......	11	26	25	......	......	......	......	......	1,000	......	40	0	0	1,000	......	100	10	0
21......	1,209	8	35	......	12	35	20	......	......	......	......	......	1,070	......	100	2	0	10,000	......	100	2	0
22......	1,195	8	40	......	13	33	24	......	......	......	......	......	1,920	......	180	4	0	1,000	......	100	4	0
23......	1,150	8	40	......	13	26	22	......	......	......	......	......	980	......	110	6	0	10	......	1,000	6	0
24......	1,139	8	40	......	14	30	21	......	......	......	......	......	1,090	......	110	8	1	1,000	......	100	10	0
25......	914	8	60	......	[illegible]	29	22	......	......	......	......	......										
26......	1,143	8	60	......	7	36	24	......	......	......	......	......	220	......	130	3	0	100	......	100	2	0
27......	1,148	8	200	......	11	36	26	......	......	......	......	......	1,100	......	210	0	2	100	......	100	2	0

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923-24—Continued

ASHLAND (KY.) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Nov., 1923	*1,000 gallons*	*° C.*																				
28	1,161	7	180	......	13	34	23	......	......	......	......	......	900	......	20	0	0	100,000	......	1,000	6	0
29	1,061	7	160	......	12	30	19	......	......	......	......	......	360	......	70	1	0	1,000	......	1,000	2	0
30	1,098	7	40	......	13	27	23	......	......	......	......	......	190	......	110	1	0	1,000	......	1,000	0	0
Mean	1,210	8	92	......	11	34	26	......	......	......	......	......	1,290	......	159	6.3	0.27	6,330	......	1,170	6.8	0
Dec., 1923																						
1	1,107	7	150	......	13	29	19	......	......	......	......	......	850	......	200	0	0	1,000	......	100	6	0
2	918	7	135	......	12	26	17	......	......	......	......	......										
3	1,193	7	650	......	15	30	24	......	......	......	......	......	1,050	......	170	1	1	1,000	......	100	0	0
4	1,130	7	750	......	15	28	19	......	......	......	......	......	1,000	......	160	1	0	10,000	......	10	0	0
5	1,100	7	450	......	14	29	17	......	......	......	......	......	800	......	250	6	3	10,000	......	100	0	0
6	1,096	7	1,000	......	15	28	14	......	......	......	......	......	1,400	......	160	1	0	10,000	......	10	4	0
7	1,096	7	1,700	......	26	23	12	......	......	......	......	......	3,000	......	560	7	1	10,000	......	10	4	0
8	1,040	7	1,000	......	12	22	12	......	......	......	......	......	950	......	350	1	0	1,000	......	10	0	0
9	918	7	800	......	18	24	14	......	......	......	......	......										
10	1,146	7	1,000	......	18	25	17	......	......	......	......	......	3,800	......	60	0	0	100	......	0	0	0
11	1,151	7	800	......	15	21	15	......	......	......	......	......	2,300	......	70	2	0	100	......	10	0	0
12	1,117	8	500	......	12	22	13	......	......	......	......	......	900	......	120	0	0	10,000	......	100	0	0
13	1,094	8	500	......	12	23	16	......	......	......	......	......	1,960	......	40	10	0	1,000	......	100	0	0
14	1,102	8	500	......	11	20	12	......	......	......	......	......	2,630	......	140	4	0	10,000	......	10	0	0
15	1,094	7	230	......	11	22	14	......	......	......	......	......	1,960	......	80	0	0	1,000	......	10	0	0
16	943	7	220	......	11	22	12	......	......	......	......	......										
17	1,252	6	210	......	18	23	10	......	......	......	......	......	520	......	40	2	0	10	......	0	0	0
18	1,851	5	200	......	14	25	14	......	......	......	......	......	1,800	......	30	3	0	10	......	10	0	0
19	1,098	5	190	......	13	20	12	......	......	......	......	......	1,600	......	110	2	1	100	......	10	2	0
20	1,106	5	150	......	12	24	18	......	......	......	......	......	1,580	......	30	1	0	10	......	10	0	0
21	1,360	6	160	......	14	29	22	......	......	......	......	......	2,200	......	60	0	0	10,000	......	100	0	0
22	879	6	160	......	14	26	19	......	......	......	......	......	380	......	50	1	0	10	......	10	0	0
23	1,151	8	1,000	......	11	25	16	......	......	......	......	......										
24	1,011	8	350	......	13	18	11	......	......	......	......	......	1,200	......	20	2	1	1,000	......	10	4	0
25	991	8	500	......	13	28	24	......	......	......	......	......	1,380	......	100	3	0	100	......	100	6	0
26	1,064	8	400	......	18	27	25	......	......	......	......	......	1,960	......	90	1	0	100	......	100	6	0

27	1,029	7	300	......	17	30	23	......	......	......	......	......	1,000	......	40	0	0	1,000	......	100	4	0
28	1,066	7	350	......	15	25	15	......	......	......	......	......	940	......	50	3	1	10,000	......	100	4	0
29	960	7	300	......	15	24	16	......	......	......	......	......	800	......	30	2	0	1,000	......	100	2	0
30	949	7	500	......	19	25	18	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
31	1,083	7	700	......	17	20	16	......	......	......	......	......	540	......	40	2	0	1,000	......	100	2	0
Mean	1,065	7	510	......	15	24	16	......	......	......	......	......	1,490	......	117	2.1	0.31	3,440	......	51	1.6	0
Jan., 1924																						
1	1,111	7	550	......	22	15	13	......	......	......	......	......	2,500	......	120	0	0	10,000	......	100	4	0
2	1,108	8	750	......	16	16	12	......	......	......	......	......	1,220	......	30	0	0	10,000	......	100	4	0
3	1,100	7	650	......	15	15	10	......	......	......	......	......	2,280	......	80	1	0	10,000	......	100	0	0
4	1,102	6	575	......	14	13	9	......	......	......	......	......	1,620	......	60	0	0	10,000	......	100	8	0
5	1,091	6	600	......	15	15	12	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
6	1,102	5	350	......	12	16	12	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
7	1,240	3	350	......	11	15	11	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
8	1,575	2	350	......	14	16	11	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
9	1,450	2	300	......	17	17	14	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
10	1,365	1	300	......	14	17	14	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
11	1,236	1	1,200	......	30	15	14	......	......	......	......	......	1,140	......	150	1	0	1,000	......	100	4	0
12	1,252	3	1,800	......	16	16	13	......	......	......	......	......	1,450	......	90	4	1	1,000	......	10	0	0
13	1,175	3	1,400	......	17	16	13	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
14	1,472	2	1,200	......	10	19	15	......	......	......	......	......	1,220	......	20	2	1	1,000	......	0	4	0
15	1,401	2	600	......	17	18	17	......	......	......	......	......	800	......	20	2	0	10,000	......	100	6	0
16	1,389	2	700	......	14	17	14	......	......	......	......	......	750	......	40	0	0	1,000	......	10	0	0
17	1,379	2	900	......	14	16	13	......	......	......	......	......	1,100	......	10	0	0	100	......	100	4	0
18	1,342	2	1,000	......	12	18	14	......	......	......	......	......	1,600	......	70	22	0	100	......	10	0	0
19	1,347	3	1,000	......	20	25	24	......	......	......	......	......	1,460	......	80	0	0	10,000	......	10	0	0
20	1,186	3	440	......	20	24	22	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
21	1,541	2	400	......	16	22	20	......	......	......	......	......	1,160	......	100	0	0	1,000	......	10	0	0
22	1,500	2	260	......	16	22	19	......	......	......	......	......	560	......	30	0	0	100	......	100	2	0
23	1,440	2	250	......	14	25	22	......	......	......	......	......	960	......	60	0	0	10,000	......	100	6	0
24	1,376	2	225	......	12	21	21	......	......	......	......	......	1,050	......	40	1	1	1,000	......	100	0	0
25	1,224	2	250	......	14	23	22	......	......	......	......	......	1,180	......	20	0	0	1,000	......	100	0	0
26	1,348	2	220	......	14	22	21	......	......	......	......	......	930	......	20	1	0	1,000	......	10	0	0
27	1,250	2	210	......	16	23	22	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
28	1,387	2	260	......	12	25	23	......	......	......	......	......	140	......	0	0	0	100	......	10	2	0
29	1,425	2	90	......	12	24	22	......	......	......	......	......	1,950	......	160	5	1	10,000	......	100	6	0
30	1,323	2	90	......	12	24	22	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
31	1,247	2	110	......	20	22	21	......	......	......	......	......	380	......	20	1	0	100	......	100	4	0
Mean	1,305	3	500	......	15	19	16	......	......	......	......	......	1,250	......	56	1.9	0.19	4,210	......	65	2.6	0
Feb., 1924																						
1	1,241	2	90	......	12	22	19	......	......	......	......	......	1,880	......	30	0	0	1,000	......	100	6	2
2	1,247	3	180	......	12	23	20	......	......	......	......	......	2,260	......	50	2	1	1,000	......	10	10	0
3	1,112	3	80	......	12	28	25	......	......	......	......	......	380	......	20	1	0	10,000	......	100	6	0
4	1,266	4	110	......	12	24	21	......	......	......	......	......	1,500	......	30	0	0	1,000	......	10	10	0
5	1,309	4	90	......	11	29	17	......	......	......	......	......	420	......	10	2	0	1,000	......	100	10	0
6	1,405	5	220	......	19	22	14	......	......	......	......	......	1,280	......	0	0	0	1,000	......	100	6	0
7	1,281	4	200	......	14	20	22	......	......	......	......	......	220	......	20	1	0	1,000	......	100	10	0

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923-24—Continued

ASHLAND (KY.) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Feb., 1924	*1,000 gallons*	*° C.*																				
8	1,367	4	350	------	14	21	21	------	------	------	------	------	710	------	30	1	1	1,000	------	100	8	0
9	1,236	2	450	------	13	21	21	------	------	------	------	------	2,380	------	40	0	0	10,000	------	1,000	4	0
10	1,199	2	220	------	12	20	20	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
11	1,309	2	150	------	13	18	19	------	------	------	------	------	980	------	10	0	0	1,000	------	100	4	0
12	1,332	2	90	------	12	20	18	------	------	------	------	------	1,520	------	20	0	0	1,000	------	10	2	0
13	1,307	1	80	------	12	29	28	------	------	------	------	------	400	------	10	0	0	1,000	------	10	4	0
14	1,402	1	70	------	10	38	36	------	------	------	------	------	250	------	30	2	2	1,000	------	10	8	0
15	1,351	1	80	------	11	27	25	------	------	------	------	------	430	------	30	0	0	1,000	------	100	6	0
16	1,249	1	70	------	12	24	22	------	------	------	------	------	380	------	60	1	1	1,000	------	1,000	4	0
17	1,138	2	90	------	9	28	26	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
18	1,311	2	210	------	14	28	26	------	------	------	------	------	1,300	------	20	1	0	10,000	------	100	10	0
19	1,308	2	200	------	10	26	23	------	------	------	------	------	2,730	------	40	5	0	1,000	------	100	2	0
20	1,319	4	1,400	------	20	25	20	------	------	------	------	------	3,500	------	30	1	0	10	------	0	0	0
21	1,261	4	1,200	------	18	22	14	------	------	------	------	------	900	------	320	3	0	1,000	------	0	0	0
22	1,319	3	900	------	40	28	11	------	------	------	------	------	2,500	------	10	0	2	1,000	------	0	0	0
23	1,334	3	350	------	24	20	14	------	------	------	------	------	2,000	------	40	1	0	10,000	------	10	0	0
24	1,142	2	180	------	25	18	14	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
25	1,365	2	160	------	20	20	21	------	------	------	------	------	620	------	40	2	0	1,000	------	100	2	0
26	1,314	3	170	------	18	22	20	------	------	------	------	------	170	------	150	13	1	1,000	------	100	0	0
27	1,149	3	140	------	16	22	21	------	------	------	------	------	300	------	90	4	20	1,000	------	10	8	0
28	1,275	4	180	------	19	23	------	------	------	------	------	------	320	------	40	3	0	1,000	------	100	6	0
29	1,255	4	190	------	20	16	19	------	------	------	------	------	650	------	150	11	5	10,000	------	1,000	2	0
Mean	1,280	3	272	------	15	25	21	------	------	------	------	------	1,030	------	52	1.8	1.1	2,690	------	168	4.9	0.08
March, 1924																						
1	1,190	4	180	------	20	19	17	------	------	------	------	------	420	------	120	9	4	1,000	------	100	6	0
2	1,078	5	140	------	15	17	15	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
3	1,191	6	95	------	14	16	14	------	------	------	------	------	325	------	190	4	2	1,000	------	100	0	0
4	1,325	7	75	------	12	18	16	------	------	------	------	------	570	------	160	18	4	1,000	------	10	0	0
5	1,430	7	75	------	13	23	21	------	------	------	------	------	600	------	210	14	1	1,000	------	100	2	0
6	1,380	7	450	------	30	19	20	------	------	------	------	------	850	------	150	3	1	1,000	------	10	0	0

7	1,734	7	300	......	85	19	14	......	......	......	......	......	740	......	140	3	3	1,000	......	1,000	0	0
8	1,123	6	300	......	20	20	18	......	......	......	......	......	280	......	90	3	2	1,000	......	100	0	0
9	1,227	6	210	......	14	15	14	......	......	......	......	......										
10	1,352	5	200	......	18	20	14	......	......	......	......	......	320	......	160	4	8	1,000	......	10	0	0
11	1,230	5	175	......	12	22	14	......	......	......	......	......	230	......	40	5	3	1,000	......	100	2	0
12	1,170	4	110	......	14	24	13	......	......	......	......	......	350	......	50	4	3	100	......	100	2	0
13	1,282	4	100	......	12	26	19	......	......	......	......	......	400	......	25	3	9	100	......	10	0	0
14	1,183	4	100	......	12	25	17	......	......	......	......	......	280	......	140	7	2	100	......	100	0	0
15	1,139	4	95	......	13	22	20	......	......	......	......	......	360	......	50	1	1	1,000	......	100	4	0
16	1,173	4	80	......	9	23	18	......	......	......	......	......										
17	1,118	4	75	......	10	24	24	......	......	......	......	......	980	......	210	2	0	1,000	......	1,000	0	0
18	1,238	4	75	......	14	24	23	......	......	......	......	......	840	......	190	1	4	1,000	......	1,000	0	0
19	1,377	5	75	......	17	20	17	......	......	......	......	......	350	......	40	3	1	1,000	......	10	0	0
20	1,362	5	75	......	10	[illegible]	17	......	......	......	......	......	670	......	160	6	2	100	......	100	0	0
21	1,130	6	185	......	40	[illegible]	22	......	......	......	......	......	1,200	......	160	7	3	1,000	......	10	8	0
22	1,110	6	275	......	28	17	15	......	......	......	......	......	1,750	......	190	9	2	10,000	......	1,000	2	0
23	1,085	5	300	......	24	15	12	......	......	......	......	......										
24	1,237	5	190	......	[illegible]	17	13	......	......	......	......	......	1,050	......	230	14	4	10,000	......	100	0	0
25	1,179	6	100	......	[illegible]	18	16	......	......	......	......	......	800	......	160	20	[illegible]	1,000	......	10	0	0
26	1,203	7	90	......	18	15	14	......	......	......	......	......	530	......	100	10	4	1,000	......	10	2	0
27	1,181	6	75	......	12	19	16	......	......	......	......	......	1,150	......	105	5	3	1,000	......	10	2	0
28	1,255	7	150	......	11	20	18	......	......	......	......	......	655	......	80	6	2	1,000	......	100	2	0
29	1,103	7	[illegible]	......	40	24	20	......	......	......	......	......	1,860	......	170	5	1	10,000	......	100	0	0
30	1,200	9	1,500	......	45	23	19	......	......	......	......	......										
31	1,060	9	1,500	......	40	27	18	......	......	......	......	......	1,500	......	110	3	2	1,000	......	10	0	0
Mean	1,225	6	252	......	22	21	14	......	......	......	......	......	731	......	136	6.6	2.9	1,900	......	204	1.2	0
April, 1924																						
1	1,187	9	1,500	......	110	27	14	......	......	......	......	......	900	......	90	4	2	1,000	......	10	0	0
2	1,257	8	1,000	......	35	18	8	......	......	......	......	......	170	......	35	2	1	100	......	0	0	0
3	1,445	8	1,000	......	26	18	11	......	......	......	......	......	800	......	95	2	0	100	......	0	0	0
4	1,332	8	350	......	30	18	11	......	......	......	......	......	1,140	......	70	7	6	1,000	......	0	0	0
5	1,128	8	300	......	26	19	12	......	......	......	......	......	150	......	40	6	2	1,000	......	100	0	0
6	1,013	8	200	......	17	19	13	......	......	......	......	......										
7	1,127	8	200	......	13	19	14	......	......	......	......	......	240	......	180	17	2	100,000	......	1,000	0	0
8	1,353	9	160	......	15	23	21	......	......	......	......	......	580	......	65	4	3	1,000	......	100	0	0
9	1,202	10	140	......	15	19	19	......	......	......	......	......	1,190	......	200	7	2	1,000	......	100	0	0
10	1,188	10	120	......	11	19	19	......	......	......	......	......	470	......	90	14	2	100,000	......	1,000	10	0
11	1,141	10	110	......	8	20	21	......	......	......	......	......	265	......	70	10	2	1,000	......	100	4	0
12	1,079	10	120	......	8	15	18	......	......	......	......	......	315	......	160	7	1	1,000	......	100	0	0
13	1,087	10	90	......	8	20	20	......	......	......	......	......										
14	1,274	11	100	......	9	21	21	......	......	......	......	......	480	......	70	8	1	100,000	......	100	2	0
15	1,280	12	80	......	10	24	23	......	......	......	......	......	475	......	105	14	4	10,000	......	1,000	6	0
16	1,142	12	130	......	15	23	27	......	......	......	......	......	165	......	80	4	2	1,000	......	100	0	0
17	1,156	13	130	......	15	23	25	......	......	......	......	......	475	......	70	8	0	1,000	......	1,000	0	0
18	1,199	12	140	......	20	35	29	......	......	......	......	......	3,980	......	590	17	1	100,000	......	1,000	2	0
19	1,140	14	500	......	26	28	24	......	......	......	......	......	900	......	70	18	1	100,000	......	1,000	2	0
20	1,246	14	300	......	35	25	21	......	......	......	......	......										
21	1,113	14	350	......	12	33	25	......	......	......	......	......	1,420	......	375	22	1	10,000	......	100	0	0
22	1,207	14	250	......	13	30	21	......	......	......	......	......	1,875	......	550	2	2	100,000	......	10,000	2	0
23	1,156	14	80	......	14	24	24	......	......	......	......	......	790	......	90	1	1	10,000	......	100	0	0

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923–24—Continued

ASHLAND (KY.) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
April, 1924	*1,000 gallons*	*° C.*																				
24	1,177	14	70	------	10	26	21	------	------	------	------	------	890	------	500	2	1	1,000	------	0	2	0
25	1,347	14	70	------	10	22	21	------	------	------	------	------	800	------	290	4	1	1,000	------	10	0	0
26	1,037	14	60	------	10	24	20	------	------	------	------	------	710	------	65	4	1	1,000	------	100	2	0
27	1,137	14	60	------	10	23	21	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
28	1,126	14	60	------	12	28	20	------	------	------	------	------	1,250	------	650	4	1	100,000	------	1,000	0	0
29	1,130	14	60	------	13	25	12	------	------	------	------	------	615	------	20	2	1	100,000	------	1,000	0	0
30	1,152	15	60	------	9	26	13	------	------	------	------	------	1,230	------	30	2	1	10,000	------	10	4	0
Mean	1,145	13	260	------	19	23	19	------	------	------	------	------	856	------	180	7.7	1.6	32,800	------	732	1.4	0
May, 1924																						
1	1,112	15	800	------	12	25	15	------	------	------	------	------	1,800	------	605	6	1	10,000	------	1,000	4	0
2	1,197	15	700	------	28	26	14	------	------	------	------	------	1,100	------	100	8	1	10,000	------	10	0	0
3	1,112	15	400	------	16	32	10	------	------	------	------	------	870	------	200	5	1	10,000	------	10	0	0
4	1,231	15	200	------	14	34	14	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
5	1,130	14	160	------	10	26	17	------	------	------	------	------	450	------	60	5	0	1,000	------	100	0	0
6	1,153	14	120	------	9	24	23	------	------	------	------	------	900	------	30	2	1	1,000	------	100	4	0
7	1,224	15	150	------	10	22	17	------	------	------	------	------	690	------	30	4	2	10,000	------	100	0	0
8	1,235	15	110	------	11	24	20	------	------	------	------	------	1,050	------	60	3	3	1,000	------	100	0	0
9	1,206	16	95	------	9	22	19	------	------	------	------	------	890	------	40	5	4	1,000	------	1,000	2	0
10	1,147	16	65	------	9	23	21	------	------	------	------	------	1,000	------	55	3	1	1,000	------	100	0	0
11	1,097	16	70	------	9	26	22	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
12	1,034	16	80	------	11	28	22	------	------	------	------	------	1,010	------	45	4	0	100,000	------	1,000	0	0
13	1,253	15	350	------	9	21	18	------	------	------	------	------	1,120	------	60	33	3	1,000	------	100	0	0
14	1,250	15	500	------	22	23	10	------	------	------	------	------	1,230	------	90	3	1	10,000	------	100	0	0
15	1,194	13	300	------	24	22	12	------	------	------	------	------	650	------	60	4	1	10,000	------	1,000	0	0
16	1,161	13	300	------	24	20	15	------	------	------	------	------	800	------	55	3	0	10,000	------	1,000	0	0
17	1,140	15	250	------	24	24	20	------	------	------	------	------	700	------	150	7	0	1,000	------	1,000	0	0
18	1,097	12	160	------	11	21	14	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
19	1,173	11	160	------	11	21	13	------	------	------	------	------	400	------	20	7	1	1,000	------	100	0	0
20	1,138	14	120	------	13	28	21	------	------	------	------	------	490	------	130	2	0	10,000	------	100	0	0

21	1,138	14	200	------	11	25	20	------	------	------	------	------	1,350	------	120	1	1	1,000	------	10,000	0	0
22	1,174	15	600	------	30	24	17	------	------	------	------	------	1,410	------	120	2	1	10,000	------	1,000	2	0
23	1,083	15	500	------	24	21	16	------	------	------	------	------	1,150	------	45	4	2	10,000	------	1,000	2	0
24	1,078	15	300	------	22	19	16	------	------	------	------	------	1,170	------	145	6	2	1,000	------	1,000	2	0
25	1,052	15	250	------	11	21	18	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
26	1,131	15	160	------	10	22	15	------	------	------	------	------	810	------	150	8	1	1,000	------	10	0	0
27	1,138	16	120	------	8	26	21	------	------	------	------	------	390	------	55	6	2	10,000	------	1,000	0	0
28	1,142	16	160	------	9	24	21	------	------	------	------	------	500	------	90	3	1	1,000	------	10	0	0
29	1,181	17	200	------	9	28	20	------	------	------	------	------	1,550	------	160	4	2	10,000	------	1,000	2	0
30	1,145	18	1,500	------	40	29	22	------	------	------	------	------	4,200	------	145	5	1	100,000	------	10,000	4	0
31	1,137	17	3,000	------	22	20	11	------	------	------	------	------	770	------	150	8	1	100,000	------	1,000	0	0
Mean	1,188	15	393	------	15	24	17	------	------	------	------	------	920	------	46	5,6	1.1	16,000	------	1,220	0.8	0
June, 1924																						
1	1,136	17	500	------	15	26	15	------	------	------	------	------	690	------	45	2	0	10,000	------	100	0	0
2	1,140	17	400	------	17	25	12	------	------	------	------	------	780	------	40	1	0	100,000	------	100	0	0
3	1,152	16	450	------	8	22	12	------	------	------	------	------	775	------	65	5	1	10,000	------	10,000	0	0
4	1,178	16	180	------	9	21	16	------	------	------	------	------	880	------	120	2	1	1,000	------	1,000	0	0
5	1,128	17	250	------	16	23	21	------	------	------	------	------	1,040	------	85	5	1	10,000	------	1,000	0	0
6	1,152	19	250	------	15	31	21	------	------	------	------	------	750	------	70	4	2	10,000	------	100	0	0
7	1,101	18	180	------	9	29	20	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
8	1,256	16	200	------	8	30	22	------	------	------	------	------	2,970	------	50	65	1	100,000	------	100	0	0
9	1,272	21	250	------	10	26	18	------	------	------	------	------	2,010	------	40	3	1	100,000	------	10,000	0	0
10	1,153	21	800	------	30	28	20	------	------	------	------	------	1,310	------	105	5	0	100,000	------	1,000	0	0
11	1,613	21	5,000	------	35	29	20	------	------	------	------	------	1,570	------	95	4	4	100,000	------	10,000	0	0
12	1,163	20	3,000	------	70	30	26	------	------	------	------	------	1,880	------	220	6	4	100,000	------	1,000	0	0
13	1,308	20	2,000	------	130	29	21	------	------	------	------	------	875	------	50	6	2	100,000	------	100	0	0
14	1,261	20	500	------	15	25	16	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
15	1,150	21	400	------	40	24	22	------	------	------	------	------	1,560	------	50	7	2	10,000	------	1,000	0	0
16	1,193	21	2,000	------	22	28	26	------	------	------	------	------	1,370	------	95	12	0	10,000	------	10,000	0	0
17	1,380	22	1,800	------	30	28	22	------	------	------	------	------	1,580	------	50	8	0	10,000	------	10,000	0	0
18	1,282	23	800	------	22	27	26	------	------	------	------	------	945	------	65	12	1	100,000	------	100	0	0
19	1,304	23	400	------	22	29	31	------	------	------	------	------	520	------	145	41	1	10,000	------	1,000	4	0
20	1,373	25	400	------	18	30	32	------	------	------	------	------	700	------	65	14	2	10,000	------	10,000	2	0
21	1,331	26	300	------	8	31	38	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
22	1,100	27	600	------	18	29	27	------	------	------	------	------	2,260	------	135	20	2	100,000	------	1,000	0	0
23	1,369	27	200	------	9	32	30	------	------	------	------	------	1,445	------	180	1	1	10,000	------	1,000	0	0
24	1,107	26	200	------	9	34	32	------	------	------	------	------	1,150	------	120	14	3	10,000	------	100	4	0
25	1,651	26	200	------	9	34	33	------	------	------	------	------	3,510	------	80	13	1	10,000	------	1,000	6	0
26	1,429	27	180	------	14	40	27	------	------	------	------	------	1,730	------	100	10	1	10,000	------	100	0	0
27	1,372	27	300	------	16	37	20	------	------	------	------	------	590	------	50	4	1	1,000	------	100	0	0
28	1,270	27	500	------	11	36	14	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
29	1,236	28	3,000	------	9	33	13	------	------	------	------	------	1,960	------	40	3	0	10,000	------	100	0	0
30	1,280	26	1,500	------	12	38	11	------	------	------	------	------										
Mean	1,261	22	895	------	22	29	22	------	------	------	------	------	1,390	------	86	11	1.3	41,700	------	2,800	0.6	0

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923–24—Continued

IRONTON (OHIO) WATER FILTRATION PLANT

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
July, 1923	*1,000 gallons*	*° C.*																				
1	1,564	23	100	35	15	21	17											1,000	100	100	0	0
2	2,193	24	190	35	15	21	20	4,440	510	100	3	0	2,350	180	80	0	2	1,000	100	100	0	0
3	1,718	24	175	35	15	26	29	4,950	240	90	5	0	4,190	530	100	3	0					
4	1,615																	1,000	100	100	0	0
5	2,151	24	180	35	15	29	25	5,550	480	210	9	4	3,290	370	180	1	2	1,000	100	100	0	0
6	1,857	24	120	35	15	29	27	4,880	660	180	4	1	4,710	630	210	18	0	1,000	100	100	0	0
7	1,773		100	35	15	26	25	9,770	1,160	670	9	0	8,330	760	640	15	0	1,000	100	100	0	0
8	1,520	24	90	35	15	25	24											1,000	100	100	0	0
9	2,058	25	80	30	15	24	25	3,740	980	240	21	2	8,620	720	270	16	1	1,000	100	100	0	0
10	2,111	26	70	30	15	23	24	2,230	140	60	3	2	3,210	310	140	7	4	1,000	100	100	10	0
11	2,009	26	60	20	10	30	24	2,130	440	100	7	4	3,520	250	80	3	1	1,000	100	100	0	0
12	2,122	24	1,250	60	15		29	3,310	540	450	25	16	4,560	380	90	19	2	1,000	100	100	10	0
13	1,767	25	550	50	15	30	26	39,600	5,280	70	4	2	26,280	(5)	210	5	0	1,000	100	100	10	0
14	1,673		400	35	15	32	30	11,320	930	130	4	2	18,650	2,180	570	75	3	1,000	100	100	10	0
15	1,907	26	200	35	15	32	26											1,000	100	100	10	0
16	1,878	25	440	35	15	28	32	3,520	380	170	8	0	4,270	430	130	24	0	1,000	100	100	0	0
17	1,881	24	550	60	15	28	30	6,020	540	60	9	4	3,910	530	90	8	2	1,000	100	100	0	0
18	1,808	25	550	60	15	32	28	10,120	690	90	4	1	5,960	620	120	5	2	1,000	100	100	0	0
19	2,018	26	570	70	25	32	30	9,150	890	130	6	2	10,210	780	140	2	3	1,000	100	100	10	0
20	2,194	25	210	35	15	33	31	6,710	1,230	290	6	6	4,220	400	210	16	5	1,000	100	100	10	0
21	1,896	26	170	35	15	33	29	18,420	2,520	720	10	3	10,960	1,970	310	4	2	1,000	100	100	10	0
22	1,791	24	120	35	15	29	29											1,000	100	100	10	0
23	1,852	24	120	35	15	30	26	19,500	2,950	400	2	1	12,320	4,240	440	1	2	1,000	100	100	0	0
24	1,999	25	100	30	15	32	28	30,380	2,430	620	12	3	41,600	9,000	710	10	2	1,000	100	100	0	0
25	1,606	25	150	35	15	31	26	34,720	5,550	1,100	12	9	14,400	4,100	2,000	110	8	1,000	100	100	10	0
26	1,947	25	270	70	15	34	32	15,500	3,610	800	60	70	10,200	2,800	530	12	5	1,000	100	100	10	0
27	1,878	25	270	70	15	33	30	13,420	1,180	250	4	2	13,350	1,360	160	18	25	1,000	100	100	10	0
28	1,575	25	275	70	15	33	22	19,840	2,010	480	50	10	21,700	(5)	970	134	2	1,000	100	100	10	0
29	1,296	25	575	70	15	33	22											1,000	100	100	0	0
30	1,541	24	300	50	15	38	22	6,300	1,200	180	3	1	(5)	3,880	80	3	4	1,000	100	100	0	0
31	1,723	24	570	35	15	38	34	6,900	870	40	3	0	6,500	750	90	10	1	1,000	100	100	0	0
Mean	1,836	24	280	43	15	30	27	11,300	1,536	305	11	5.8	10,054	1,616	342	20	3	1,000	100	100	4.3	0

Aug., 1923																						
1	1,616	24	570	35	15	38	34	5,000	500	70	10	5	4,500	450	100	5	5	----	----	----	----	----
2	1,513	25	400	35	15	39	35	4,000	350	125	15	5	4,000	550	40	1	5	----	----	----	----	----
3	1,735	25	400	70	25	31	31	4,000	425	125	10	0	8,500	450	225	10	2	----	----	----	----	----
4	1,371	25	360	35	15	31	26	8,500	400	(5)	10	10	6,500	300	60	0	2	----	----	----	----	----
5	1,276	25	400	35	15	29	18	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
6	1,518	25	480	30	15	26	17	3,000	200	20	0	0	4,500	300	125	5	1	33,300	3,330	167	0	0
7	1,346	25	500	30	15	24	16	5,000	450	80	5	4	7,000	300	90	10	3	33,300	3,330	167	0	0
8	1,766	26	650	35	15	----	20	3,500	300	70	5	1	(5)	250	60	10	2	33,300	3,330	167	0	0
9	2,189	25	625	35	15	----	20	2,500	125	30	0	2	5,000	300	100	5	3	33,300	3,330	167	6	0
10	1,950	25	625	40	15	39	30	5,000	450	100	5	2	9,000	950	250	5	3	16,700	3,330	167	6	0
11	1,632	25	550	70	20	40	39	7,500	900	600	40	3	8,000	1,000	175	10	5	33,300	3,330	167	10	0
12	1,354	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
13	2,189	25	400	50	15	21	25	5,500	800	125	15	1	6,000	600	125	5	1	33,300	3,330	167	6	0
14	1,663	24	1,600	70	15	----	23	7,500	850	150	1	4	10,000	900	150	5	2	33,300	3,330	333	0	0
15	1,973	24	1,000	70	15	21	12	9,000	900	70	5	0	4,000	450	80	0	0	33,300	1,670	167	0	0
16	1,503	24	700	60	15	----	7	6,500	450	90	0	0	(5)	800	40	5	0	16,700	3,330	125	0	0
17	1,846	23	500	60	15	16	16	4,500	450	60	0	0	6,000	400	250	5	0	12,500	1,670	125	0	0
18	1,700	22	480	40	15	37	23	5,500	400	125	0	0	8,000	900	225	10	5	16,700	1,670	125	0	0
19	1,268	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
20	1,931	23	250	35	15	28	21	4,500	400	60	1	0	6,000	500	80	5	0	12,500	1,250	125	0	0
21	946	23	200	35	15	33	26	30,500	1,200	175	5	0	30,500	1,500	175	0	0	12,500	1,250	167	0	0
22	2,402	20	160	35	15	33	20	23,000	1,300	125	5	0	38,000	3,000	90	15	5	33,300	1,250	10	4	0
23	1,739	22	120	35	15	30	20	10,500	2,200	100	0	0	26,000	2,500	80	5	0	12,500	1,670	167	4	0
24	1,910	22	100	35	15	29	26	19,000	2,100	100	5	5	15,500	1,500	225	0	0	16,700	1,250	167	0	0
25	1,747	22	90	30	15	30	20	11,500	1,000	225	30	5	(6)	(6)	(6)	(6)	(6)	33,300	1,250	125	4	0
26	1,281	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
27	2,107	23	70	30	15	28	32	----	----	----	----	----	----	----	----	----	----	16,700	1,670	167	2	0
28	1,554	24	60	30	15	26	33	3,700	300	125	10	2	3,500	300	150	75	5	16,700	3,330	333	10	0
29	1,834	23	140	30	15	31	29	3,500	350	125	5	0	4,500	550	175	0	1	16,700	1,670	333	2	0
30	1,644	23	150	30	15	31	29	2,300	250	200	5	1	2,500	275	175	5	0	16,700	1,250	333	4	0
31	1,531	23	60	30	15	35	20	2,000	175	125	1	0	3,000	250	(5)	10	5	16,700	1,250	100	0	0
Mean	1,678	24	426	41	15	26	23	7,600	660	128	6	1.9	9,590	809	135	8	2.2	23,200	2,260	177	2.5	0
Sept., 1923																						
1	1,442	23	60	30	15	33	23	2,000	250	90	5	2	3,500	800	80	20	3	33,300	1,670	167	2	0
2	1,189	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	12,500	1,670	333	6	0
3	1,409	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
4	1,656	24	50	30	15	35	28	1,500	150	60	2	4	(5)	900	270	10	2	12,500	1,670	333	6	0
5	1,523	24	50	30	15	34	26	2,500	450	90	0	0	7,500	250	90	5	0	33,300	1,670	333	8	0
6	1,500	24	50	30	15	34	26	----	----	----	----	----	----	----	----	----	----	----	----	----	10	0
7	1,451	24	70	30	15	38	30	2,500	200	----	120	0	6,500	1,500	----	10	0	16,700	----	333	10	0
8	1,152	23	160	30	15	34	18	7,500	600	150	1	0	7,500	2,500	(5)	10	3	16,700	3,330	1,000	8	0
9	1,209	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	16,700	3,330	333	8	0
10	1,857	22	80	30	15	42	25	3,000	350	90	0	1	2,000	250	200	0	0	12,500	3,330	333	0	0
11	1,441	22	80	30	15	48	33	3,500	250	125	0	0	2,500	(5)	60	5	0	12,500	3,330	167	0	0
12	1,324	22	70	30	15	49	39	2,500	100	70	5	1	3,000	350	(5)	5	5	16,700	1,250	125	2	0
13	1,297	21	60	30	15	47	38	3,000	300	90	10	2	2,000	200	80	20	0	12,500	1,670	125	2	0

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[5] Spreader.

[6] Polluted.

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923–24—Continued

IRONTON (OHIO) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Sept., 1923	*1,000 gallons*	*°C.*																				
14	1,330	20	60	30	15	46	37	2,000	300	125	20	6	2,500	150	60	10	0	16,700	1,250	125	0	0
15	1,465	20	60	30	15	47	34	1,500	100	40	10	2	2,000	200	60	15	2	16,700	1,670	167	2	0
16	1,100																					
17	1,509	21	40	30	15	44	35	2,000	150	60	1	1	2,500	200	60	5	0	12,500	1,250	100	2	0
18	1,382	21	30	35	15	41	30	2,500	600	160	15	0	3,500	650	125	10	2	10,000	1,250	125	0	0
19	1,498	21	50	35	15	33	32	2,000	500	70	15	5	5,500	600	125	25	5	16,700	3,330	167	4	0
20	1,496	22	50	35	15	38	32	7,500	800	100	10	0	3,000	500	60	10	2	16,700	1,250	167	0	0
21	1,372	20	40	30	15	40	33	9,000	1,000	350	50	1	9,000	1,000	250	20	1	12,500	1,670	167	2	0
22	1,346	20	40	30	15	41	26	11,000	1,000	125	0	5	13,000	1,500	300	75	6	16,700	3,330	167	2	2
23	880																					
24	1,500	22	80	35	15	41	25	7,000	1,200	250	25	10	8,500	1,000	600	75	5	33,300	10,000	333	6	0
25	1,465	21	80	35	15	30	25	2,500	250	60	5	1	2,500	250	150	20	0	12,500	3,330	167	2	0
26	1,348	21	90	35	15	40	32	6,500	400	80	5	1	6,000	500	50	25	0	33,300	1,670	167	2	0
27	1,390	22	80	35	15	42	23	4,000	250	70	5	1	3,000	250	60	5	0	33,300	1,670	333	2	0
28	1,461	22	60	35	15	38	26	2,000	250	140	5	2	2,000	(5)	60	5	1	16,700	1,670	333	0	0
29	1,283	22	90	35	15	37	25	6,000	800	100	30	2	6,000	1,100	100	10	2	33,300	3,330	333	2	0
30	1,150																					
Mean	1,380	22	66	33	15	40	24	4,000	440	108	18	2	4,700	690	140	12	1.7	19,100	2,480	257	3.4	0.08
Oct., 1923																						
1	798	19	80	30	15	39	26	5,000	300	100	15	4	3,000	300	180	25	10	10,000	1,670	167	0	0
2	1,292	19	60	35	15	40	26	3,500	250	80	2	0	4,000	200	60	10	1	16,700	1,670	167	0	0
3	1,193	20	40	35	15	40	25	6,000	300	150	10	5	6,000	(5)	125	10	10	16,700	1,670	167	0	0
4	1,431	20	30	35	15	40	20	4,500	300	60	2	7	6,500	260	120	2	0	12,500	1,670	100	0	0
5	1,542	20	30	35	15	36	38	3,000	300	150	0	3	2,000	100	70	3	2	12,500	1,250	100	2	0
6	1,261	19	30	35	15	40	33	5,000		120	2	0	6,500	600	180	15	7	33,300	1,670	167	2	0
7	765																					
8	2,151	18	30	35	15	40	33	3,000	150	70	5	10	3,500	250	100	4	2	33,300	1,670	125	2	0
9	1,233	16	20	30	15	41	32	2,000	200	80	0	0	6,000	550	150	3	5	12,500	1,250	1,000	4	0
10	1,485	17	20	30	15	42	34	3,500	250	60	15	4	2,000	150	(5)	5	2	16,700	1,250	333	4	0
11	1,393	17	20	30	15	40	29	1,500	100	60	3	4	3,500	250	100	2	3	12,500	3,330	1,000	4	2
12	1,037	17	20	30	15	42	30	4,000	250	70	5	1	6,000	700	50	15	2	33,300	1,250	125	4	2

13	985	17	15	25	10	44	31	1,500	250	50	5	3	2,500	450	150	5	4	33,300	1,250	333	8	2
14	876																					
15	1,430	17	10	20	10	45	31	2,000	300	60	3	2	4,000	250	70	5	11	16,700	1,670	167	2	0
16	1,289	17	10	20	10	50	46	6,000	450	250	30	3	3,000	150	50	20	0	12,500	1,250	167	0	0
17	1,514																					
18	1,013																					
19	1,459																					
20	1,099																					
21	905	16	10	20	15	45	29	5,500	450	150	2	2	6,000	1,000	300	2	0	10,000	1,250	167	2	0
22	1,589	16	10	20	15	43	33	11,000	850	350	8	0	7,000	350	200	10	2	12,500	3,330	333	2	0
23	1,364	16	10	20	15	40	34	7,500	850	350	15	10	4,000	500	(5)	4	3	10,000	1,250	333	2	0
24	1,348	14	10	20	15	40	23	5,500	300	60	0	1	5,500	450	120	3	0	12,500	3,330	167	0	0
25	915	14	10	20	15		33		600	170	30	2		500	100	10	5		1,250	125	4	0
26	1,561	14	10	30	15	42	32	4,000	600	180	5	0	8,000	500	(5)	0	2	16,700	1,670	333	0	0
27	1,119	14	20	30	15	36	32	3,500	720	600	2	0	4,500	800	250	3	0	16,700	1,250	1,000	2	0
28	1,122																					
29	1,211	14	20	30	15	41	35	4,500	870	300	0	0	5,000	550	150	1	2	12,500	1,670	333	2	0
30	1,516	14	20	30	15	44	37	4,500	150	80	1	0	5,000	250	100	2	0	16,700	10,000	333	0	0
31	1,455	14	15	35	15	42	28	4,000	900	100	2	0	3,500	450	110	15	5	12,500	3,330	333	0	0
Mean	1,270	17	22	28	14	40	30	4,570	421	154	6.5	2.5	4,630	430	120	7.3	3.3	17,100	2,120	316	1.9	0.3
Nov., 1933																						
1	1,391	12	10	30	15	42	27	4,500	50	70	4	0	5,000		80	3	1	16,700	3,330	167	2	0
2	1,502	12	10	30	15	41	28	4,000	120	50	0	1	6,500	150	50	0	0	12,500	3,330	333	2	0
3	1,331	13	20	30	15	40	30															
4	1,150	13	10	30	15	42	29	5,000	1,100	800	4	0	4,000	(6)	350	2	0	16,700	10,000	1,000	4	0
5	1,438	13	120	35	15	48	34	5,000	400	110	1	1	5,000	350	120	6	0	16,700	3,330	333	2	0
6	1,434	12	115	35	15	53	35	5,500	580	60	0	0	4,000	570	50	0	2	33,300	1,670	100	0	0
7	1,444	12	200	35	15	55	40	5,000	500	120	3	2	4,000	260	80	2	3	12,500	1,670	333	0	0
8	1,408	12	240	35	15	53	42	6,500	1,250	230	16	4	4.000	(6)	60	(6)	0	10,000	1,250	125	0	0
9	1,426							6,000	2,000	200	20	1	5,560	520	150	1	1	16,700	3,330	1,000	2	0
10	1,445	12	100	35	15	49	25															
11	1,253	11	120	40	20	42	20	5,500	500	180	3	6	4,000	400	120	0	0	10,000	1,000	125	2	0
12	1,356	11	95	35	15	34	24	5,500	400	130	1	2	2,500	200	90	1	1	10,000	1,000	125	0	0
13	1,588	10	80	35	15	33	25	5,000	500	110	1	0	1,500	240	50	4	0	12,500	1,250	100	4	0
14	1,500	11	75	35	15	27	23	3,000	500	180	0	0	1.500	230	50	0	0	12,500	1,000	125	0	0
15	1,477	10	75	35	15	27	18	4,000	700	150	3	1	1,500	120	40	0	0	10,000	1,250	100	0	0
16	1,540	10	60	35	15	28	24	2,500	250	50	0	0	(6)	300	30	0	0	12,500	1,670	100	0	0
17	855																	10,000	1,000	333	2	0
18	1,566																					
19	1,519																					
20	1,457																					
21	1,565																					
22	1,326																					
23	1,686																					
24	1,431																					
25	998																					
26	1,506																					
27	1,564																					

[5] Spreader.

[6] Polluted.

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923–24—Continued

IRONTON (OHIO) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Nov., 1923	*1,000 gallons*	*° C.*																				
28	1, 356																					
29	1, 307	8	125	35	15	22	17	5, 500	1, 200	680	12	4	3, 000	260	40	2	3	10, 000	1, 670	100	0	0
30	1, 482	7	140	35	15	34	13	7, 500	1, 000	300	9	2	1, 200	160	70	3	0	10, 000	1, 000	100	0	0
Mean	1, 420	11	94	33	15	40	27	4, 000	690	213	4. 8	1. 5	3, 550	290	90	1. 6	0. 69	13, 600	2, 280	271	1. 2	0
Dec., 1923																						
1	1, 204																					
2	460	8	400	35	15	36	24	10, 000	1, 500	480	6	1	2, 000	200	30	0	0	12, 500	1, 250	100	0	0
3	1, 712	8	500	35	15	30	25	12, 000	1, 700	300	6	0	1, 250	100	70	8	0	12, 500	1, 000	100	0	0
4	1, 463	9	625	45	15	27	21	16, 000	1, 360	820	(6)	6	1, 500	120	40	4	0	10, 000	1, 000	100	2	0
5	1, 757	9	600	60	15	23	23	18, 000	4, 000	650	50	5	1, 500	160	50	0	0	16, 700	1, 670	167	0	0
6	1, 281	9	600	60	15	26	16	15, 000	2, 500	1, 200	75	40	2, 000	170	80	2	0	12, 500	1, 000	167	4	0
7	1, 639	10	500	40	15	27	19	19, 000	1, 200	500	23	1	2, 500	(5)	110	5	1	12, 500	1, 000	167	2	0
8	1, 317																					
9	1, 056	9	300	40	15	34	24	(4)	1, 700	600	60	0	1, 500	100	170	5	0	10, 000	1, 670	125	4	0
10	1, 506	9	500	40	15	24	18	35, 000	6, 000	750	5	1	2, 500	250	80	10	(6)	10, 000	1, 250	167	4	0
11	1, 566	9	500	40	15	24	10	15, 000	300	300	10	0	3, 000	(5)	250	4	2	16, 700	1, 250	333	0	0
12	1, 419	9	400	50	15	26	11	24, 000	5, 000	1, 000	25	1	2, 500	500	50	4	4	12, 500	10, 000	167	0	0
13	1, 381	8	300	50	15	23	16	20, 000	5, 500	1, 750	60	12	650	300	90	0	0	33, 300	1, 000	167	0	0
14	1, 498	8	200	40	15	20	10	10, 000	3, 500	900	7	5	2, 000	200	180	5	3	16, 700	1, 670	167	0	0
15	1, 132																					
16	1, 287	7	260	40	15	24	13	25, 000	5, 600	1, 350	20	4	1, 200	500	40	0	0	16, 700	1, 250	100	2	0
17	1, 474	7	260	60	15	24	13	86, 000	10, 000	700	40	2	1, 500	600	50	3	1	16, 700	1, 670	125	0	0
18	1, 476	7	260	60	15	22	15	44, 000	13, 000	800	75	2	4, 500	1, 100	600	4	0	33, 300	3, 330	125	0	0
19	1, 485	7	150	35	15	22	17	23, 500	2, 000	(5)	40	1	2, 100	300	120	5	1	12, 500	1, 670	125	0	0
20	1, 408	7	180	35	15	22	16	10, 000	2, 400	500	3	3	1, 200	110	40	0	0	16, 700	1, 000	100	0	0
21	1, 406	7	160	35	16	23	13	11, 000	220	400	2	0	2, 000	250	50	1	0	16, 700	1, 000	100	0	0
22	1, 443																					
23	1, 056	7	240	60	15	29	20	25, 000	3, 500	380	1	0	2, 300	400	30	0	0	16, 700	1, 250	100	0	0
24	1, 265																					
25	1, 032	7	600	70	15	26	15	46, 000	8, 900	900	20	2	4, 200	720	200	0	0	12, 500	3, 330	333	2	0
26	1, 495	7	550	40	15	20	10	(4)	800	420	1	0	3, 500	80	20	0	0	33, 300	100	100	0	0

27	987	7	170	35	15	16	13	14,500	1,000	450	4	2	1,800	200	60	0	0	12,500	100	10	0	0
28	1,376	8	350	35	15	16	8	12,000	500	300	6	0	2,600	200	90	3	1	10,000	100	100	0	0
29	1,156																					
30	984	8	250	35	15	22	19	26,000	1,200	350	4	0	4,000	100	60	0	1	10,000	100	10	0	0
31	1,354	8	250	35	15	18	8	18,000	6,500	220	3	0	2,100	300	(5)	0	1	10,000	100	100	0	0
Mean	1,324	8	404	44	15	24	16	23,000	3,700	660	22	3.5	2,230	300	109	1.4	0.6	15,700	1,550	134	0.8	0
Jan., 1924																						
1	1,101	7	600	60	15	13	8	26,500	1.760	160	12	2	4,200	340	20	1	0	16,700	100	10	0	0
2	1,324	6	500	60	15	16	6	18,800	1,200	540	17	1	(5)	160	70	0	1	·10,000	100	100	0	0
3	1,471	6	450	40	15	18	7	24,600	3,000	1,000	15	1	3,000	350	60	1	0	10,000	1,670	167	0	0
4	1,430	5	400	35	15	18	15	21,000	1,200	500	3	1	8,900	500	170	0	1	16,700	1,670	100	0	0
5	1,434																					
6	1,605	4	350	35	15	16	7	11,500	800	600	8	0	1,700	140	60	0	0	12,500	1,250	125	0	0
7	1,362	3	350	35	15	15	6	9,000	1,000	630	8	2	1,400	130	90	1	0	10,000	100	167	0	0
8	1,348	2	200	35	15	18	5	17,500	450	200	3	0	2,000	300	50	(6)	0	10,000	100	167	0	0
9	1,436	2	170	35	15	19	10	8,500	700	200	2	2	2,300	110	50	0	0	10,000	1,250	125	0	0
10	1,996	2	500	35	15	20	23	26,000	1,800	500	5	0	2,200	130	120	0	0	12,500	100	167	0	0
11	1,473	2	460	35	15	19	10	50,000	2,000	400	12	1	4,600	300	50	0	1	12,500	1,000	333	2	0
12	1,444																					
13	1,395	2	625	60	15	26	13	50,000	4,600	1,200	15	0	9,200	600	40	2	0	10,000	100	10	0	0
14	1,499	2	800	60	15	19	14	90,000	6,000	2,000	100	0	4,200	450	60	1	0	12,500	1,000	10	0	0
15	944	2	350	60	15	18	10	75,000	3,000	1,000	6	3	3,000	200	40	0	0	12,500	1,000	125	2	0
16	1,670	2	550	60	15	13	10	100,000	3,000	500	53	30	4,700	240	80	1	0	12,500	100	125	0	0
17	823	2	300	40	15	14	13	75,000	7,800	1,300	110	12	2,000	360	40	0	0	12,500	1,670	125	2	0
18	1,284	2	500	40	15	20	13	60,000	5,000	1,400	60	6	6,400	330	50	0	0	12,500	3,330	125	0	0
19	1,438																					
20	1,355	1	400	35	15	14	7	40,000	1,600	650	17	30	5,600	400	60	1	0	16,700	1,000	167	0	2
21	1,560	1	350	35	15	13	7	54,000	2,600	1,100	20	0	4,000	350	120	0	0	12,500	1,250	100	0	0
22	1,000	1	250	30	15	18	14	56,000	1,000	200	0	0	1,100	120	20	0	0	16,700	1,000	100	0	0
23	1,531	1	240	30	15	18	14	38,000	1,000	750	10	0	1,700	110	40	0	1	16,700	1,250	100	0	0
24	1,005	1	180	30	15	18	1[illegible]	55,000	6,000	1,850	36	10	1,200	100	30	0	0	12,500	1,670	125	0	0
25	1,481	1	380	30	15	23	20	20,000	750	200	10	0	2,600	160	40	0	0	10,000	1,000	100	0	0
26	1,558																					
27	1,319	1	150	30	15	24	20	10,000	1,000	180	8	1	1,300	150	40	1	0	12,500	1,000	125	0	0
28	2,181	1	100	30	15	26	23	20,000	1,280	800	40	0	(6)	100	50	4	1	10,000	100	167	2	0
29	1,606	1	90	30	15	29	28	15,000	1,400	500	25	0	1,000	80	20	0	1	12,500	1,250	100	0	0
30	1,278	1	80	25	10	29	28	10,000	1,200	500	100	0	(6)	120	80	0	0	10,000	100	10	0	0
31	638	1	85	20	10	27	32	20,000	2,000	680	50	3	1,800	40	20	0	0	10,000	1,000	100	2	0
Mean	1,386	2	350	38	15	20	14	37,400	2,340	724	27	2.7	3,300	240	60	0.5	0.2	12,400	932	118	0.4	0.07
Feb., 1924																						
1	1,421	1	90	20	10	25	25	9,000	1,400	700	20	8	1,200	180	40	1	0	10,000	100	100	2	0
2	1,745																					
3	1,380	2	150	30	15	33	33	18,500	1,750	800	20	(6)	1,400	70	20	0	0	12,500	100	167	0	0
4	931	2	155	30	10	31	33	27,000	3,200	900	50	4	2,300	140	30	0	1	1,000	100	125	0	0
5	600	2	190	30	15	24	29	27,500	2,250	750	75	1	2,000	120	30	11	0	10,000	1,000	167	2	0

[5] Spreader.

[6] Polluted.

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923–24—Continued

IRONTON (OHIO) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Feb., 1924	*1,000 gallons*	*° C.*																				
6	817	2	220	35	15	15	17	20,000	1,300	540	36	8	800	130	70	2	0	12,500	100	100	4	0
7	637	2	220	35	15	15	19	40,000	2,800	400	10	10	1,250	100	40	0	0	12,500	1,000	125	0	0
8	1,941	2	280	35	15	20	18	26,000	2,800	(4)	120	8	800	120	60	2	0	10,000	1,000	10	2	0
9	1,222																					
10	1,877	2	280	35	15	23	32	40,000	3,000	1,100	80	0	1,200	120	90	1	0	12,500	1,000	100	0	0
11	1,990	2	200	35	15	18	13	26,000	2,600	450	42	25	800	90	40	1	0	16,700	1,000	10	0	0
12	1,294	2	150	30	15	17	19	14,700	1,200	180	25	0	550	50	50	1	0	10,000	10	10	2	0
13	978	2	120	30	15	18	18	15,000	1,250	500	50	46	1,000	80	20	2	0	10,000	10	10	4	0
14																						
15	1,801	2	100	35	15	22	15	20,000	1,700	1,000	90	3	1,000	200	(4)	10	1	12,500	100	10	4	0
16	1,559																					
17	692	2	110	30	15	29	14	26,000	4,000	1,300	21	8	1,400	140	100	0	0	12,500	100	10	2	2
18	1,600	2	150	35	15	34	17	32,000	2,800	350	15	56	820	130	80	2	1	10,000	100	125	0	2
19	1,242	2	360	40	15	32	26	74,000	5,800	1,500	68	15	1,500	160	60	0	0	12,500	100	125	2	0
20	1,059	2	600	60	15	25	22	112,000	6,400	2,000	(5)	5	1,460	320	60	0	0	16,700	1,250	167	0	0
21	877	2	800	70	15	21	14	76,000	8,000	2,000	310	10	2,750	1,000	90	0	0	16,700	1,000	125	0	2
22	2,169	2	500	70	15	20	14	72,000	8,500	2,400	215	21	3,000	800	200	0	0	16,700	1,670	167	4	2
23	2,139																					
24	1,309	2	200	30	15	20	24	26,000	1,800	800	20	1	1,500	270	110	0	0	12,500	1,000	125	0	0
25	1,512	2	310	35	15	14	21	20,000	1,000	400	16	1	860	60	30	0	0	1,000	10	10	0	0
26	950	2	400	30	15	18	10	25,000	1,500	750	8	2	1,100	120	20	0	1	10,000	100	100	0	0
27	700	2	610	30	15	21	15	40,000	2,500	1,500	60	2	3,000	120	30	1	0	16,700	1,250	125	0	0
28	1,000	2	190	30	15	25	21	35,000	3,200	1,300	200	2	1,200	100	20	0	0	12,500	1,000	167	2	0
29	1,000	2	150	30	15	31	27	(5)	4,500	2,100	120	0	1,300	120	40	2	0	33,300	1,250	333	4	0
Mean	1,350	2	300	36	15	23	20	35,700	3,130	1,020	72	10	1,425	200	58	1.5	0.17	12,600	598	105	1.4	0.3
March, 1924																						
1	1,417																					
2	1,469	5	120	30	15	34	29	20,000	2,100	1,200	14	42	1,300	110	30	0	1	10,000	1,250	100	2	0
3	1,478	6	80	30	15	31	30	20,000	1,500	600	36	2	1,400	140	60	1	0	12,500	1,000	10	0	0
4	1,465	5	80	30	15	30	32	16,000	2,000	360	35	2	1,200	190	20	0	0	12,500	1,000	10	0	0
5	1,877	5	100	30	15	30	27	35,000	1,000	200	10	1	850	60	20	0	0	12,500	1,000	10	0	0

6	506	5	100	30	15	33	35	25,000	1,200	160	45	0	900	40	20	1	1	10,000	1,250	100	2	0
7	1,218	4	510	40	15	28	31	60,000	4,800	2,000	300	4	1,700	280	50	0	0	12,500	1,000	167	0	0
8	1,331																					
9	1,400	4	350	35	15	23	25	100,000	16,000	6,000	800	5	3,540	380	80	8	1	12,500	1,250	125	6	0
10	1,156	4	200	30	15	18	17	90,000	6,000	700	9	45	3,000	350	240	2	0	16,700	1,250	125	0	2
11	1,029	3	200	30	15	15	17	46,000	4,300	540	85	2	1,400	210	30	1	0	10,000	1,000	125	0	0
12	1,150	3	160	30	15	19	23	46,000	5,000	480	65	0	1,200	60	20	2	2	10,000	1,000	10	0	0
13	1,440	3	130	30	15	20	12	40,000	1,500	1,100	60	0	1,000	80	50	2	0	12,500	1,000	10	2	0
14	1,491	2	120	30	15	23	21	23,700	1,000	500	30	0	800	80	0	0	0	10,000	100	10	0	0
15	1,516																					
16	1,490	3	90	20	15	28	23	17,500	500	200	6	22	620	50	20	0	1	10,000	1,000	125	0	0
17	1,473	3	85	20	15	28	23	14,600	310	90	13	23	700	50	20	1	0	12,500	1,000	100	2	0
18	1,510	3	80	20	10	28	24	25,000	1,000	200	40	2	600	20	10	0	0	10,000	100	10	0	0
19	1,440	4	80	20	10	30	26	45,000	4,000	300	100	2	(4)	50	20	0	0	12,500	1,000	10	0	0
20	900	4	120	20	10	30	27	60,000	4,500	800	220	5	1,400	110	30	0	2	33,300	1,000	100	0	0
21	1,575	4	250	30	10	27	26	43,000	3,500	1,000	50	3	1,600	150	40	1	0	16,700	1,000	10	0	0
22	986																					
23	1,320	4	350	35	15	24	22	90,000	3,800	1,800	250	2	1,800	420	30	1	0	12,500	1,670	10	0	0
24	1,528	4	220	35	15	24	26	80,000	3,000	1,000	200	0	1,200	170	30	1	0	12,500	1,000	100	0	0
25	1,303	4	110	30	15	22	23	65,000	5,000	350	100	2	1,200	80	0	0	0	16,700	1,000	100	0	0
26	1,274	5	190	30	10	22	26	35,000	4,000	200	42	3	800	90	20	0	0	10,000	100	10	0	0
27	1,131	6	140	30	10	22	29	26,000	1,150	200	35	2	1,100	60	20	0	2	10,000	100	10	0	0
28	1,840	7	250	40	10	26	26	39,000	2,250	600	7	3	1,100	140	40	1	0	12,500	1,000	125	0	0
29	1,180																					
30	1,215	7	400	35	15	23	21	75,000	4,500	1,250	12	54	3,000	220	80	10	11	12,500	1,250	125	0	2
31	1,519	6	2,000	70	25	-----	25	86,000	6,000	4,000	(4)	1	3,500	500	80	2	0	16,700	1,250	125	2	0
Mean	1,342	4	180	31	14	25	25	46,600	3,600	990	100	8.7	1,470	157	40	1.3	0.81	13,100	945	68	0.6	0.2
April, 1924																						
1	1,798	7	800	80	25	25	27	95,000	10,000	3,600	(4)	4	3,000	600	90	12	4	16,700	1,670	167	8	0
2	1,625	7	600	70	15	20	17	100,000	8,000	2,000	400	6	2,600	180	70	8	1	16,700	1,250	125	2	0
3	1,930	7	400	60	15	18	18	60,000	4,140	1,500	150	0	4,000	530	100	1	1	12,500	1,000	100	0	0
4	1,455	7	300	35	15	21	23	70,000	3,000	1,000	38	1	2,300	210	60	3	0	10,000	1,000	100	0	0
5	1,642																					
6	1,551	7	210	35	15	24	19	41,000	3,600	1,120	150	2	2,000	400	90	3	8	10,000	1,000	100	4	0
7	1,119	8	190	35	15	23	25	32,000	2,800	270	116	4	2,300	280	180	10	2	12,500	1,000	125	2	0
8	1,702	8	160	30	15	21	24	40,000	2,000	520	86	2	1,200	110	30	1	1	12,500	100	10	0	0
9	1,467	8	140	30	15	21	26	23,600	2,400	1,000	22	5	1,800	120	20	1	0	10,000	100	100	0	0
10	1,660	9	120	30	15	21	17	20,100	1,470	660	3	1	1,600	130	60	0	0	10,000	100	100	0	0
11	1,483	9	110	35	15	17	10	19,500	1,750	800	9	1	800	80	20	0	0	10,000	100	100	0	0
12	1,232																					
13	1,200	10	110	30	15	20	10	6,000	650	70	0	0	700	60	10	0	0	1,000	100	100	0	0
14	1,573																					
15	1,142	12	100	------	15	22	20	8,700	--------	120	0	0	600	-------	210	2	0	10,000	-------	100	0	0
16	923	13	80	------	15	24	20	7,000	--------	40	0	0	700	-------	120	0	0	10,000	-------	10	0	0
17	1,697	12	130	30	15	22	22	14,000	1,570	380	19	0	800	110	70	0	0	10,000	1,000	100	0	0
18	1,649	12	150	30	15	23	24	14,800	750	400	20	1	1,000	100	60	0	1	10,000	1,000	100	0	0
19	967																					
20	954	12	230	35	15	30	18	3,000	650	150	5	1	2,750	370	90	0	0	16,700	1,000	10	2	0

[4] Spreader.

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923–24—Continued

IRONTON (OHIO) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
April, 1924	*1,000 gallons*	*° C.*																				
21	1,317	12	175	35	15	32	30	20,000	1,130	300	0	1	3,000	150	400	1	1	10,000	1,000	100	0	0
22	1,204	12	150	30	15	28	22	6,000	400	150	3	0	1,210	150	60	1	0	10,000	100	100	0	0
23	1,276	12	140	30	15	28	21	23,000	2,500	800	10	0	2,320	200	20	1	0	1,000	1,000	125	0	0
24	1,076	12	110	30	15	29	20	10,000	970	330	40	4	3,500	200	50	3	3	1,000	100	125	2	0
25	1,423	12	100	30	15	25	12	48,000	4,400	140	10	0	2,800	240	20	0	1	1,000	1,000	10	2	0
26	1,106																					
27	1,133	13	90	30	10	25	22	12,500	1,400	540	6	0	3,900	250	80	0	1	16,700	1,000	125	2	0
28	864	13	90	30	10	25	20	8,400	240	220	2	0	1,450	60	10	2	0	10,000	100	125	0	0
29	862	13	80	30	10	23	22	28,000	1,000	150	6	0	1,750	210	30	1	1	10,000	1,000	100	0	0
30	1,429	13	90	35	15	27	22	14,000	360	400	2	1	1,650	170	80	3	1	10,000	1,000	167	2	0
Mean	1,349	10	194	37	15	24	20	28,600	2,400	664	45	1.3	2,013	213	81	2.1	1	9,930	727	97	1	0
May, 1924																						
1	1,359	13	250	35	15	27	22	34,000	700	1,100	53	3	2,000	220	90	1	0	16,700	1,000	167	2	0
2	1,000	13	250	35	15	29	22	50,000	1,000	600	3	4	2,300	240	40	1	1	12,500	1,000	10	0	0
3	979																					
4	718	13	350	40	15	28	15	22,000	3,600	800	4	4	4,700	600	80	0	1	12,500	1,670	100	0	0
5	847	13	250	35	15	26	22	20,000	2,300	300	20	3	2,800	390	30	2	1	10,000	1,250	100	2	0
6	1,647	14	350	35	15	24	25	28,000	1,400	200	28	0	2,500	240	130	0	1	10,000	1,000	100	0	0
7	1,276	16	330	35	15	22	26	9,500	680	120	2	3	2,000	220	120	4	1	10,000	1,000	167	0	0
8	1,136	14	250	35	15	26	22	27,100	1,800	270	11	4	1,860	220	70	0	1	10,000	1,000	100	0	0
9	1,312	14	120	35	15	25	20	21,000	630	100	0	2	3,400	290	100	1	1	12,500	1,250	100	4	0
10	1,034																					
11	1,035	14	100	35	15	27	20	7,500	510	450	0	0	2,500	230	400	0	1	10,000	1,250	100	0	0
12	1,068	14	300	40	15	19	23	8,700	500	300	0	0	2,750	350	120	0	1	10,000	1,250	125	0	0
13	1,650	13	350	70	25	19	20	30,000	4,500	1,100	8	4	2,660	470	50	1	6	12,500	1,670	167	4	0
14	1,430	13	350	50	15	19	21	30,000	2,520	630	17	1	2,600	250	20	2	1	16,700	1,670	100	0	0
15	1,557	13	240	35	15	19	14	23,400	2,200	540	14	0	3,600	110	40	0	12	16,700	1,250	10	0	0
16	1,175	12	210	35	15	16	10	24,200	2,000	730	0	0	2,640	300	60	0	0	12,500	1,250	10	0	0
17	962																					
18	460	13	160	35	15	22	10	26,000	270	900	6	1	2,160	(4)	180	0	0	10,000	100	10	0	0
19	796	13	125	35	15	21	9	20,000	2,200	300	8	0	3,000	400	50	0	0	10,000	10	10	0	0

20	1, 151	13	125	35	15	23	11	21, 000	2, 000	660	30	1	1, 800	500	80	1	0	12, 500	1, 250	100	0	0
21	1, 465	13	120	35	15	24	15	22, 500	2, 000	650	20	5	2, 240	330	40	7	0	10, 000	1, 000	100	0	0
22	1, 586	14	120	35	10	26	22	20, 000	1, 500	900	40	6	2, 000	450	150	0	2	10, 000	1, 000	100	0	0
23	1, 332	14	100	30	10	24	22	16, 500	1, 400	120	7	1	2, 600	180	100	3	0	10, 000	1, 250	100	0	0
24	1, 116																					
25	[illegible]	15	90	30	10	22	23	18, 000	1, 600	120	20	0	1, 370	190	60	0	1	10, 000	1, 250	10	0	0
26	1, 132	15	85	30	10	22	19	7, 000	600	140	25	4	1, 760	80	30	2	2	10, 000	100	100	0	0
27	1, 133	15	95	30	10	23	24	21, 000	450	260	40	2	2, 600	370	140	2	0	12, 500	1, 000	10	0	0
28	1, 021	16	90	30	10	22	24	15, 000	880	100	1	4	(4)	200	80	2	5	1, 000	10	10	0	0
29	1, 100	16	240	35	15	22	26						4, 300	1, 060	800	7	0	33, 300	1, 670	333	6	0
30	781	16	200	35	15	27	26											12, 500	1, 250	100	2	0
31	1, 106																					
Mean	1, 140	14	197	36	14	23	20	22, 200	1, 550	470	15	2	2, 640	330	104	1. 4	1. 4	12, 100	1, 050	90	0. 8	0
June, 1924																						
1	215																					
2	821																					
3	1, 420																					
4	989	16	100	35	15	24	19	26, 000		460	1	0	2, 600	660	40	2	0	12, 500	100	10	0	0
5	1, 037	16	130	35	15	25	18	(4)	1, 200	400	12	4	2, 500	500	86	2	1	10, 000	1, 000	100	0	0
6	867	17	100	35	15	26	18	12, 600	500	80	0	9	1, 800	110	40	2	0	10, 000	100	10	0	0
7	1, 077																					
8	688	18	120	30	15	27	15	12, 800	730	350	3	2	2, 640	360	90	1	0	10, 000	100	10	0	0
9	1, 461	18	350	35	15	24	27	11, 000	1, 460	560	11	1	3, 000	910	150	0	0	16, 700	1, 000	100	2	0
10	347	19	330	35	15	35	30	10, 000	500	100	9	1	2, 960	650	200	10	6	16, 700	1, 670	100	2	0
11	1, 483	20	560	45	15	30	28	7, 800	1, 250	500	67	8	9, 500	(5)	250	4	0	16, 700	1, 670	167	4	0
12	1, 167	20	650	60	15	26	18	7, 600	850	460	20	0	6, 000	800	190	3	1	16, 700	1, 670	125	0	0
13	1, 472	20	450	60	15	27	22	8, 200	910	300	10	1	6, 600	750	240	1	0	16, 700	1, 250	167	2	0
14	678																					
15	410	20	300	35	15	29	15	9, 600	600	240	2	0	8, 200	200	10	0	0	12, 500	1, 000	100	0	0
16																						
17	2, 010	21	300	35	15	34	25	14, 000	880	300	18	3	4, 500	300	50	0	0	12, 500	1, 000	100	2	0
18	955	22	300	35	15	26	28	7, 600	1, 100	100	4	0	2, 500	200	10	1	0	12, 500	1, 000	100	0	0
19	1, 190	23	300	30	10	34	24	6, 000	650	140	2	17	3, 700	290	90	23	4	12, 500	1, 000	100	0	0
20	1, 158	24	240	30	10	35	40	8, 600	1, 460	120	30	1	(5)	110	80	1	0	12, 500	1, 000	100	4	0
21	1, 311																					
22	558	24	140	30	10	36	30	7, 600	460	100	3	1	5, 000	450	110	1	0	10, 000	1, 670	100	0	0
23	1, 200	24	160	30	10	40	34	6, 200	720	300	2	1	2, 700	180	190	3	2	10, 000	1, 250	100	2	0
24	1, 232	25	240	35	15	40	34	6, 000	610	70	1	5	4, 760	630	60	2	0	12, 500	1, 000	10	0	0
25	937	24	230	35	15	36	37	8, 500	760	60	2	2	4, 250	190	150	1	0	12, 500	1, 000	10	0	0
26	1, 752	24	200	35	15	38	28	11, 400	1, 630	500	14	(5)	9, 000	1, 000	180	8	1	12, 500	1, 250	100	0	0
27	462	24	240	35	15	38	26	5, 000	380	40	2	0	4, 600	350	80	2	1	10, 000	1, 000	10	0	0
28	1, 010																					
29	628	25	230	30	10	40	30	8, 800	1, 400	800	10	6	5, 300	320	400	2	1	16, 700	1, 250	167	2	2
30	1, 532	24	1, 700	100	25	30	30	30, 000	2, 500	1, 100	27	0	28, 000	2, 400	1, 020	20	0	33, 300	3, 330	333	6	0
Mean	1, 300	21	330	39	14	32	25	10, 700	979	280	11	2. 8	4, 760	450	170	4	0. 7	13, 900	1, 150	96	1. 2	0. 09

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[4] Spreader.

[5] Polluted.

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923–24—Continued

PORTSMOUTH (OHIO) WATER FILTRATION PLANT

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
August, 1923	*1,000 gallons*	*°C.*																				
1	5,370	28	380	30	15	34	23	8,000	700	400	9	0	4,800	500	350	17	0	10,000	1,000	100	4	0
2	4,260	28	480	35	20	33	21	10,000	1,000	800	18	0	5,000	700	500	14	0	10,000	1,000	100	4	0
3	5,770	28	230	20	10	30	16	5,400	700	500	30	0	4,300	600	400	38	0	1,000	1,000	100	4	0
4	5,420	28	330	28	12	32	23	10,000	950	700	60	0	5,400	700	500	30	0	1,000	1,000	100	6	0
5	5,400	28	350	35	18	32	20	9,600	1,100	800	65	0	6,400	1,200	750	40	0	1,000	100	100	2	0
6	5,500	28	300	20	12	32	19	10,000	1,200	950	16	0	3,600	550	400	14	0	10,000	1,000	100	4	0
7	5,340	28	325	25	15	33	22	5,400	475	350	0	0	3,400	375	275	0	0	10,000	100	100	2	0
8	5,280	28	550	38	20	32	20	11,000	900	700	30	0	7,200	600	400	35	0	1,000	1,000	100	4	0
9	5,460	27	500	30	15	33	27	6,000	900	700	38	0	4,500	750	500	30	0	1.000	1,000	100	4	0
10	5,150	27	400	25	15	36	26	10,000	1,100	650	55	1	2,700	700	550	38	0	10,000	1,000	100	2	0
11	5,570	27	380	30	18	33	26	10,000	1,100	750	30	0	4,800	900	700	48	0	10.000	1,000	100	4	0
12	5,570	27	280	20	12	32	21	4,800	600	500	24	0	9,200	1,000	850	30	0	10.000	1,000	100	2	0
13	4,930	27	400	28	12	35	19	6,500	750	700	25	0	7,200	1,100	800	48	0	10,000	1,000	100	6	0
14	5,600	27	900	40	18	38	21	15,000	1,300	900	40	0	5,800	750	650	20	0	10,000	1,000	100	2	0
15	5,440	27	950	120	35	36	25	16,000	2,000	1,400	75	0	3.000	800	700	20	0	10,000	1,000	100	0	0
16	5,570	27	400	35	20	34	27	14,000	1,500	1,100	70	0	3,000	600	400	20	0	1,000	1,000	100	4	1
17	5,570	26	380	30	15	35	18	9,000	1,300	1,000	45	0	2,700	600	500	25	0	1,000	100	100	4	0
18	5,580	25	320	28	15	38	24	6,000	900	700	15	0	1,400	375	325	12	0	1.000	100	10	2	0
19	5,590	25	220	20	12	34	22	6,100	800	600	34	0	1,200	400	300	15	0	1,000	100	10	0	0
20	5,560	25	200	23	12	34	20	3,100	1,000	750	40	0	2,500	750	600	34	1	1,000	100	10	0	0
21	5,670	25	160	20	10	33	20	4,000	700	500	36	0	3,700	600	500	20	0	1,000	100	100	4	0
22	5,820	25	130	18	12	34	24	3,600	600	450	5	0	1,500	400	300	2	0	1,000	100	10	0	0
23	6,270	25	100	20	10	32	23	3,500	700	500	4	0	1,800	400	350	16	0	1,000	100	100	0	0
24	6,950	24	90	20	8	33	22	3,000	600	400	4	0	1,700	500	400	8	0	1,000	1,000	100	4	0
25	6,800	24	60	20	8	34	26	1.800	500	400	15	0	1,600	500	400	6	0	1,000	100	100	2	1
26	6,820	25	40	10	8	34	24	3,000	700	500	12	0	1,500	700	900	5	0	1,000	100	100	4	1
27	6,740	25	35	8	6	34	24	1,500	500	700	10	0	3,000	1,200	800	40	0	1,000	100	10	4	0
28	6,880	25	28	10	6	33	27	3,500	1,200	800	50	0	3,600	600	550	9	0	1,000	100	10	2	0
29	6,810	25	20	6	4	35	36	4,200	600	550	12	0	2,700	400	350	4	0	1,000	100	100	2	0
30	6,950	26	28	10	6	34	36	2,500	300	200	5	0	2,000	500	400	30	0	1,000	100	100	2	0
31	6,860	25	24	6	4	34	31	1,800	250	225	8	0	1,900	475	250	10	0	1,000	100	10	0	0
Mean	5,822	26	290	26	13	33	23	6,700	850	650	28	0	3,600	650	500	21	0	3,900	536	80	2.7	0.1

Sept., 1923																					
1	6,580	25	25	10	4	34	31	1,900	500	400	40	0	1,500	400	350	18	0	1,000	1,000	100	4	0
2	6,710	26	30	10	4	35	32	1,800	500	400	20	0	1,700	400	400	40	0	1,000	1,000	10	4	1
3	6,420	26	30	8	6	35	30	1,500	600	400	30	0	1,400	600	450	25	0	1,000	1,000	100	2	0
4	5,810	26	30	8	4	33	36	1,500	400	350	18	0	1,300	375	300	10	0	1,000	1,000	100	2	0
5	5,690	26	32	12	8	35	36	1,700	750	550	20	0	2 100	800	600	35	0	1,000	1,000	100	2	0
6	5,870	26	20	8	6	34	32	2,100	700	600	20	0	2,000	600	500	25	0	1,000	100	100	4	0
7	5,800	25	20	8	6	34	29	2,000	600	500	48	0	1,500	500	450	50	0	1,000	100	100	4	0
8	5,790	25	20	8	6	34	34	1,000	300	275	28	0	1,400	500	400	40	0	1,000	100	100	4	0
9	4,220	25	20	8	6	34	36	1,900	600	475	39	0	1,700	500	400	38	0	1,000	1,000	100	2	0
10	5,910	25	40	------	12	35	38	1,200	--------	550	40	0	1,100	-------	600	35	0	1,000	-------	100	2	0
11	5,870	25	45	------	10	39	37	1,000	--------	500	18	0	900	-------	500	24	0	1,000	-------	100	4	0
12	5,670	25	40	------	12	42	39	1,600	--------	700	50	0	900	-------	400	50	0	1,000	-------	100	8	0
13	5,960	25	20	4	3	38	34	1,300	--------	600	45	0	1,000	-------	475	50	0	1,000	-------	100	6	0
14	6,000	25	8	4	2	39	38	1,400	700	650	50	1	1,300	550	500	45	0	1,000	100	10	4	0
15	5,910	25	10	4	2	40	38	1,500	600	500	40	0	1,200	600	400	45	0	1,000	100	100	4	0
16	4,890	25	10	4	2	37	42	1,200	600	500	40	1	900	400	375	24	0	1,000	100	100	2	0
17	5,860	25	12	4	2	39	33	800	300	225	18	0	750	300	200	25	0	1,000	100	10	2	0
18	5,770	25	20	8	4	43	35	750	225	200	12	0	700	200	160	9	0	1,000	100	10	2	0
19	5,770	25	20	7	5	43	36	1,200	350	300	20	0	900	300	275	18	0	1,000	100	10	0	0
20	5,130	25	14	4	2	41	40	900	250	200	8	0	750	300	225	12	0	1,000	100	10	0	0
21	5,450	25	10	4	2	39	37	950	200	175	21	0	700	150	120	7	0	1,000	100	100	2	0
22	5,550	25	25	8	4	38	42	1,800	450	300	28	0	1,200	400	350	28	0	1,000	1,000	100	2	0
23	4,980	25	12	4	2	38	44	1,300	350	250	14	0	950	275	225	22	0	1,000	100	10	2	0
24	5,320	25	14	4	2	42	48	1,800	450	270	25	0	1,700	450	300	12	0	1,000	1,000	100	4	0
25	5,760	25	12	6	4	41	46	1,500	325	225	20	0	1,600	500	300	18	0	1,000	1,000	100	4	0
26	5,540	25	18	4	2	43	49	1,500	300	200	18	0	1,200	325	275	21	0	1,000	100	100	4	1
27	4,660	25	40	18	8	41	45	2,100	300	250	18	0	1,500	350	275	21	0	1,000	100	10	2	0
28	5,390	25	12	6	4	36	43	1,200	300	200	14	0	1,600	400	275	10	0	1,000	100	100	4	0
29	5,040	25	12	6	2	39	46	900	175	125	12	0	1,200	200	125	10	0	1,000	100	100	2	0
30	5,110	24	20	8	6	37	43	1,000	300	200	18	0	1,000	225	200	20	1	1,000	100	10	0	0
Mean	5,624	25	21	7	4	38	38	1,400	425	375	26	0	1,250	400	350	25	0	1,000	412	73	2.9	0.07
Oct., 1923																					
1	4,780	24	16	6	4	38	45	1,100	250	200	100	4	1,500	375	300	70	1	1,000	100	100	10	1
2	5,130	24	15	6	4	41	50	1,200	275	275	95	2	2,000	375	200	44	2	1,000	100	100	10	0
3	5,320	23	10	6	6	42	48	1,800	350	300	75	0	2,000	475	275	50	0	1,000	100	10	6	0
4	5,780	23	20	8	6	45	46	2,500	475	350	120	3	2,100	400	300	85	0	1,000	100	100	10	1
5	5,320	23	20	6	6	44	40	2,000	300	225	70	0	1,800	325	200	48	1	1,000	100	100	10	1
6	4,690	23	16	6	5	43	45	2,100	375	300	110	0	1,800	300	200	93	0	1,000	100	100	10	0
7	5,070	22	10	4	4	44	48	1,600	300	200	95	4	1,500	300	225	100	1	1,000	100	100	10	0
8	5,450	22	10	6	4	45	44	1,600	375	200	10	0	1,300	475	175	10	0	1,000	100	100	2	0
9	6,050	22	8	4	2	43	46	1,500	350	125	10	0	1,200	400	225	21	0	1,000	100	10	0	0
10	6,930	21	8	4	2	43	48	1,200	200	175	25	0	1,000	300	100	4	0	1,000	100	100	0	0
11	6,800	21	15	4	3	41	46	1,100	275	200	20	0	1,300	225	100	2	0	1,000	100	10	0	0
12	6,800	21	10	4	4	44	46	1,400	400	125	35	0	1,200	300	225	12	0	1,000	100	10	2	0
13	6,190	21	9	5	4	42	45	1,700	450	175	25	0	1,300	400	275	2	0	100	100	10	0	0
14	5,740	20	10	6	2	43	46	1,200	350	200	25	0	1,200	350	175	5	0	100	100	100	3	0
15	5,460	20	12	4	4	43	47	800	150	75	12	0	1,100	250	175	21	0	100	100	10	0	0
16	5,530	20	8	4	3	44	48	600	150	150	14	0	900	225	125	10	0	100	100	10	0	0

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923–24—Continued

PORTSMOUTH (OHIO) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Oct., 1923	*1,000 gallons*	° *C.*																				
17	6, 510	20	7	3	3	44	46	750	300	275	10	0	900	275	175	10	0	100	100	10	0	0
18	6, 300	20	10	4	4	43	46	1, 100	350	400	45	0	700	200	100	2	0	100	10	10	0	0
19	4, 730	20	8	6	4	43	47	1, 800	475	350	22	0	1, 000	350	225	20	0	100	100	10	0	0
20	4, 980	20	18	4	2	43	52	2, 300	525	400	40	1	1, 000	375	275	12	0	1, 000	100	10	2	0
21	4, 740	20	25	8	4	43	49	3, 600	900	400	100	0	2, 700	700	300	8	0	1, 000	100	100	2	0
22	5, 240	20	40	6	6	42	48	5, 500	600	275	75	0	3, 300	375	200	30	0	1, 000	100	100	5	0
23	4, 900	20	45	8	6	46	49	4, 000	475	200	50	3	3, 700	225	200	35	1	1, 000	100	10	2	0
24	5, 170	20	40	4	3	46	49	3, 000	225	225	50	1	2, 800	200	125	12	0	1, 000	10	10	1	0
25	4, 470	20	25	4	4	47	45	2, 000	275	100	70	0	1, 300	125	100	30	0	1, 000	100	10	1	0
26	5, 100	19	20	3	2	45	46	1, 900	100	90	40	0	1, 000	100	80	30	0	1, 000	10	10	8	0
27	5, 060	19	10	2	2	47	44	900	100	125	28	0	800	125	100	28	0	1, 000	100	100	4	0
28	5, 580	18	12	4	4	46	44	1, 100	200	175	37	0	700	90	70	20	0	1, 000	10	10	2	0
29	5, 380	18	9	5	3	45	43	3, 000	425	225	15	0	1, 000	275	150	2	0	1, 000	100	100	2	0
30	5, 360	17	5	3	2	46	45	1, 800	375	225	30	0	1, 300	300	175	0	0	1, 000	100	100	0	0
31	5, 490	17	5	3	2	46	41	1, 000	850	275	30	0	1, 500	1, 300	400	29	1	1, 000	1, 000	100	10	0
Mean	5, 485	20	15	5	4	44	46	1, 820	380	220	80	0. 6	1, 530	360	190	27	0	797	117	54	3. 6	0. 1
Nov., 1923																						
1	4, 480	16	5	5	3	44	42	1, 200	1, 000	200	40	0	1, 200	1, 200	300	5	0	1, 000	1, 000	100	10	0
2	4, 870	15	8	7	4	42	34	1, 200	1, 000	200	30	0	1, 100	900	200	10	0	1, 000	1, 000	100	9	0
3	5, 970	15	8	8	4	43	35	1, 400	1, 200	400	40	0	1, 200	900	275	9	0	1, 000	1, 000	100	10	0
4	5, 140	14	15	12	6	45	37	1, 900	1, 450	450	55	0	1, 000	700	200	7	0	1, 000	1, 000	100	10	0
5	4, 710	14	45	10	4	47	39	2, 100	300	200	40	0	1, 100	300	175	3	0	1, 000	100	10	0	0
6	5, 680	13	90	12	8	44	39	4, 900	1, 000	600	30	1	1, 700	300	120	0	0	1, 000	100	100	2	0
7	5, 550	13	100	25	10	42	39	8, 300	1, 200	500	10	0	1, 600	200	50	0	0	10, 000	100	100	2	0
8	4, 820	12	90	15	7	39	36	8, 900	600	400	55	0	2, 200	400	200	0	0	1, 000	100	100	1	0
9	5, 250	12	100	14	7	42	34	8, 000	1, 000	500	59	0	2, 000	300	200	0	0	1, 000	100	100	2	0
10	5, 450	11	150	18	8	41	35	4, 500	900	400	30	0	1, 400	300	100	0	0	1, 000	100	100	2	0
11	5, 300	11	135	18	6	40	34	8, 000	750	350	28	0	1, 000	250	120	0	0	1, 000	100	10	2	0
12	5, 040	11	100	85	20	37	30	7, 500	6, 000	200	25	0	1, 800	1, 600	375	2	0	1, 000	100	100	2	0
13	5, 580	11	70	65	20	33	35	4, 300	4, 000	1, 000	80	1	1, 400	1, 300	200	30	0	1, 000	1, 000	100	0	0
14	5, 620	11	50	40	10	33	27	2, 100	1, 800	600	70	0	1, 250	900	200	0	0	1, 000	1, 000	100	1	0
15	5, 010	10	30	30	8	31	22	1, 500	1, 100	400	30	0	1, 000	900	150	0	0	1, 000	1, 000	100	1	0

16	5,440	10	40	30	6	34	20	1,800	1,700	500	40	0	650	500	100	25	0	1,000	1,000	100	10	0
17	5,060	10	20	15	4	37	24	1,600	1,500	350	30	0	400	300	75	0	0	1,000	1,000	100	10	0
18	5,520	10	20	12	4	39	27	2,300	2,000	550	50	0	375	300	80	0	0	1,000	1,000	100	1	0
19	5,040	10	12	6	4	40	32	2,000	650	475	42	0	325	50	35	10	0	1,000	1,000	100	0	0
20	5,000	10	18	10	5	39	33	5,800	950	600	51	0	300	45	12	2	0	1,000	100	10	0	0
21	5,570	10	15	8	4	33	29	9,000	2,100	1,000	18	0	350	90	14	0	0	1,000	100	10	0	0
22	5,650	10	28	10	8	32	27	8,000	1,400	750	60	0	325	70	51	0	0	1,000	100	10	0	0
23	4,690	9	30	12	7	29	25	5,800	1,200	900	65	0	250	20	12	0	0	1,000	100	100	0	0
24	5,120	9	35	10	4	29	28	3,800	550	375	12	0	550	75	40	0	0	1,000	100	100	0	0
25	4,510	9	45	12	8	32	27	4,300	1,300	800	45	0	500	59	30	0	0	1,000	100	10	0	0
26	4,850	9	70	15	8	32	25	6,000	900	450	8	0	300	75	40	0	0	1,000	100	10	0	0
27	5,200	9	100	18	10	33	25	6,300	900	500	10	0	650	90	65	0	0	10,000	100	10	0	0
28	4,470	9	100	18	8	32	24	6,800	900	400	10	0	475	90	38	0	0	10,000	1,000	100	0	0
29	5,280	9	140	20	8	29	23	12,000	1,900	900	42	0	600	250	180	0	0	10,000	100	10	0	0
30	4,350	9	90	18	8	28	23	9,100	1,000	450	51	0	550	75	27	0	0	10,000	100	10	0	0
Mean	5,154	11	59	19	7	37	30	5,200	1,000	500	40	0	925	425	120	4	0	2,500	460	70	2.5	0
Dec., 1923																						
1	4,810	9	200	28	14	30	20	14,000	1,800	1,100	140	0	600	120	70	0	0	1,000	100	10	0	0
2	4,930	9	175	18	8	31	19	18,000	2,000	1,200	140	0	700	190	100	2	0	10,000	1,000	100	0	0
3	4,590	9	400	28	10	32	19	12,000	2,000	1,400	300	1	800	175	100	0	0	10,000	1,000	100	0	0
4	4,770	9	360	28	10	33	40	10,000	2,100	2,800	250	3	1,000	170	180	1	0	10,000	100	100	2	0
5	4,975	9	375	32	10	33	25	15,000	3,100	1,400	175	2	900	275	125	0	0	10,000	1,000	100	0	0
6	4,400	9	225	20	10	30	14	34,000	4,200	2,200	300	8	1,125	250	175	0	0	10,000	1,000	100	0	0
7	5,320	9	325	30	12	28	24	60,000	4,500	2,200	95	0	1,900	250	130	0	0	10,000	1,000	100	0	0
8	5,590	9	225	20	10	30	23	90,000	8,000	5,000	300	0	3,800	375	275	2	0	10,000	1,000	10	0	0
9	5,800	9	275	35	15	37	22	48,000	5,500	3,000	400	0	3,000	850	500	5	0	10,000	1,000	100	0	0
10	5,960	9	250	30	14	38	20	24,000	4,000	2,400	400	0	2,600	250	130	0	0	10,000	1,000	100	0	0
11	5,800	9	300	30	12	33	20	40,000	6,000	3,000	275	0	2,000	600	400	0	0	10,000	100	10	0	0
12	5,860	9	200	18	8	34	23	15,000	1,000	600	100	0	1,600	200	90	0	0	1,000	100	10	2	0
13	6,320	8	225	20	8	34	25	20,000	2,000	1,200	175	0	1,000	400	175	0	0	1,000	100	100	0	0
14	6,770	9	150	20	10	33	26	36,000	2,500	1,200	90	0	1,400	230	180	0	0	1,000	100	10	0	0
15	6,720	9	140	20	10	35	28	27.000	3,000	1,800	200	0	950	170	60	0	0	1,000	100	10	0	0
16	6,860	9	200	28	12	27	15	38,000	5,000	3,000	275	0	1,100	300	175	0	0	1,000	100	10	0	0
17	6,650	9	200	28	12	23	13	30,000	2,000	1,500	120	0	1,000	250	175	0	0	10,000	1,000	100	0	0
18	6,950	9	130	20	12	23	16	38,000	3,000	2,300	130	0	800	160	100	0	0	10,000	1,000	100	0	0
19	6,340	9	165	20	8	25	13	60,000	3,000	3,000	300	0	900	260	300	2	0	10,000	1,000	100	0	0
20	5,790	10	100	20	8	24	14	28,000	4,000	2,000	275	0	700	100	40	0	0	1,000	100	10	0	0
21	5,840	10	95	20	10	23	12	33,000	4,000	2,800	200	0	700	120	70	0	0	1,000	100	10	0	0
22	5,500	10	100	20	12	23	12	24,000	3,500	2,000	175	0	500	100	70	0	0	1,000	100	10	0	0
23	2,990	11	170	20	14	39	26	20,000	2,000	1,000	28	0	700	85	40	0	0	1,000	100	10	0	0
24	6,220	11	190	25	10	30	19	30,000	2,800	1,500	120	0	700	100	48	0	0	1.000	100	10	0	0
25	6,790	10	220	30	12	38	25	42,000	3,000	2,400	200	0	1,000	200	100	0	0	1,000	100	10	0	0
26	6,680	10	300	20	10	24	12	50,000	3,200	1,300	90	0	1,800	225	140	0	0	10,000	100	10	0	0
27	7,080	10	250	18	8	23	12	20,000	1,400	900	10	0	1,200	200	100	0	0	1,000	100	10	0	0
28	5,730	10	190	20	8	24	12	35,000	3,400	2,100	100	0	1,100	90	60	0	0	1,000	100	10	0	0
29	5,720	10	175	28	12	20	10	40,000	3,600	2,000	130	0	1,000	100	50	0	0	1,000	100	10	0	0
30	5,650	9	200	30	12	23	20	20,000	1,800	1,000	30	0	1,200	175	100	0	0	1,000	100	10	0	0
31	5,490	8	170	28	12	30	40	24,000	3,000	1,900	95	0	1,400	400	200	0	0	1,000	100	10	0	0
Mean	5,770	9	220	24	11	29	19	32,000	3,300	2,200	190	0	1,300	240	140	0	0	5,060	419	45	0.1	0

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923–24—Continued

PORTSMOUTH (OHIO) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Jan., 1924	*1,000 gallons*	° *C.*																				
1	5,870	9	175	20	8	35	43	36,000	2,000	1,000	200	0	1,000	110	60	0	0	1,000	100	100	0	0
2	5,700	9	500	40	18	34	41	24,000	3,000	2,000	275	0	1,100	100	62	1	0	1,000	100	10	0	0
3	5,780	8	400	14	8	23	42	40,000	2,400	1,500	120	2	1,500	200	100	0	0	1,000	100	100	0	0
4	5,880	7	325	20	20	24	40	24,000	2,000	2,000	220	3	1,400	150	70	0	0	1,000	100	100	0	0
5	5,710	5	200	15	8	18	35	20,000	1,800	1,000	175	5	1,000	100	80	0	0	10,000	100	10	0	0
6	7,190	5	170	28	14	23	35	7,000	900	600	150	0	600	75	38	0	0	1,000	100	100	0	0
7	6,940	5	180	20	10	33	35	4,800	1,000	700	180	3	400	58	35	0	0	100	10	10	2	0
8	7,450	5	170	12	8	34	35	5,100	500	500	75	3	300	40	18	0	0	1,000	100	10	0	0
9	7,740	4	170	20	10	29	37	4,700	900	600	100	0	400	55	35	0	0	1,000	100	10	0	0
10	7,590	4	150	28	14	24	25	3,800	900	900	200	0	400	130	80	0	0	1,000	100	10	0	0
11	6,790	5	200	20	10	18	19	5,200	700	900	80	0	1,000	90	44	0	0	1,000	100	10	0	0
12	6,230	5	350	35	12	30	34	15,000	2,000	1,000	200	2	900	40	20	0	0	1,000	100	100	0	0
13	5,860	5	380	30	12	28	37	12,000	1,000	600	12	0	1,000	175	100	0	0	1,000	100	100	1	0
14	6,780	5	325	35	10	28	41	12,000	2,000	1,000	210	10	1,000	130	75	0	0	1,000	100	10	0	0
15	7,260	5	230	28	10	30	35	12,000	1,000	500	78	0	800	85	40	0	0	1,000	100	100	0	0
16	7,050	5	180	20	8	32	36	7,100	1,000	450	51	0	600	50	30	0	0	1,000	100	10	0	0
17	7,540	5	140	40	25	29	37	14,000	2,000	900	110	0	700	400	280	1	0	1,000	100	100	1	0
18	6,790	5	230	40	20	30	36	22,000	2,000	950	200	10	1,100	300	140	2	0	1,000	100	100	0	0
19	7,790	5	380	48	20	34	35	30,000	4,200	2,400	400	8	840	200	170	0	0	10,000	100	100	0	0
20	4,880	5	280	35	20	37	34	11,000	1,800	2,000	275	8	900	250	200	2	0	1,000	100	100	3	0
21	7,540	4	175	18	7	40	38	25,000	2,700	1,500	280	2	1,000	200	90	0	0	1,000	100	10	1	0
22	7,700	4	175	20	8	39	42	12,000	1,800	1,200	200	2	800	140	50	0	0	1,000	100	100	1	0
23	7,540	4	140	30	10	38	35	12,000	1,200	1,400	300	2	550	70	48	0	0	1,000	100	100	0	0
24	5,920	4	160	28	14	36	37	10,000	1,500	900	180	8	400	50	28	0	0	1,000	100	100	2	0
25	6,090	4	120	20	12	32	36	8,000	1,000	400	100	10	375	50	20	0	0	1,000	100	10	0	0
26	5,930	4	100	12	8	30	32	4,800	900	900	125	0	400	48	19	0	0	1,000	100	10	0	0
27	7,310	4	80	12	6	29	30	3,000	500	300	57	0	325	50	30	0	0	1,000	100	10	0	0
28	7,970	4	60	10	5	28	29	2,300	700	400	100	2	275	38	20	0	0	1,000	100	10	0	0
29	6,640	4	45	10	5	32	35	3,800	1,000	1,000	200	6	175	20	10	0	0	100	10	10	0	0
30	6,070	4	45	18	8	31	26	3,000	500	400	100	0	300	40	22	0	0	1,000	10	10	0	0
31	5,680	4	60	18	10	32	33	3,600	900	400	100	4	130	40	18	0	0	1,000	10	10	0	0
Mean	6,684	5	203	24	11	31	35	12,000	1,400	900	160	3	700	90	60	0	0	1,520	88	51	0.3	0

Feb., 1924																					
1.......	5,830	4	45	18	10	30	38	3,000	700	400	70	1	140	20	14	0	0	1,000	100	10	0	0
2.......	6,110	4	35	8	4	32	37	3,000	1,400	900	100	5	240	60	28	0	0	10,000	100	10	0	0
3.......	5,560	4	30	10	4	30	32	2,000	300	200	18	0	140	35	20	0	0	10,000	10	10	0	0
4.......	5,640	4	40	10	5	29	37	4,100	1,000	1,000	16	0	240	35	20	0	0	10,000	100	10	0	0
5.......	6,170	4	40	10	5	28	37	5,800	1,800	1,200	190	10	450	28	10	0	0	1,000	100	10	0	0
6.......	5,940	5	100	20	8	27	30	7,000	1,000	575	10	0	480	100	70	1	0	1,000	100	100	0	0
7.......	5,970	5	180	35	12	34	33	7,000	1,400	875	125	5	700	100	40	0	0	1,000	100	100	0	0
8.......	6,040	5	210	28	10	37	34	6,400	1,000	800	120	1	610	78	50	0	0	10,000	100	100	0	0
9.......	6,310	5	170	30	8	35	34	5,800	700	400	85	1	500	100	50	0	0	1,000	100	100	0	0
10......	7,180	5	130	20	6	33	29	6,100	1,000	500	12	0	420	60	38	0	0	1,000	100	100	1	0
11......	7,020	5	120	24	10	33	29	10,000	1,800	1,000	200	5	440	50	38	0	0	1,000	100	10	0	0
12......	6,440	5	90	20	12	32	28	4,000	800	1,000	90	0	320	50	30	0	0	1,000	100	100	0	0
13......	6,110	5	60	12	4	30	30	4,000	900	480	30	0	300	60	30	0	0	1,000	100	10	0	0
14......	5,760	5	70	8	4	33	31	3,200	800	580	70	0	525	40	20	0	0	1,000	100	10	0	0
15......	5,650	5	90	12	8	33	37	2,800	750	500	90	0	440	48	30	0	0	1,000	100	10	0	0
16......	5,790	5	120	18	8	34	35	4,300	1,800	975	50	0	500	55	20	0	0	1,000	100	10	0	0
17......	5,410	5	120	15	7	32	31	9,000	675	600	100	0	875	70	50	1	0	10,000	100	100	1	0
18......	5,390	5	170	20	10	30	33	12,000	2,100	1,000	90	0	720	90	55	0	0	10,000	1,000	100	2	0
19......	5,890	6	275	35	15	33	37	30.000	4,100	2,500	300	1	1,020	120	50	0	0	10,000	1,000	100	2	0
20......	4,760	6	330	40	12	32	30	28,000	2,000	1,200	180	4	1,500	300	100	0	0	10,000	1,000	100	2	0
21......	6,390	6	350	45	28	30	28	21,000	1,300	800	60	0	1,200	180	90	0	0	10,000	100	100	2	0
22......	6,650	6	500	45	20	42	38	28,000	1,500	900	70	0	1,800	130	50	0	0	10,000	100	10	0	0
23......	7,330	6	480	40	18	43	39	24,000	4,000	2,900	300	4	1,200	50	50	0	0	1,000	100	100	0	0
24......	8,060	6	230	18	6	40	34	28,000	2,000	1,000	180	0	900	80	40	1	0	10,000	100	100	0	0
25......	6,820	6	200	18	8	41	39	20,000	1,000	700	35	0	850	50	20	0	0	1,000	100	10	0	0
26......	7,580	6	175	25	10	40	39	12,000	1,300	800	130	0	600	55	30	0	0	1,000	100	100	0	0
27......	6,560	7	150	18	8	37	40	9,000	2,000	1,100	130	0	720	60	30	0	0	1,000	100	100	0	0
28......	4,060	7	110	12	4	34	38	7,000	850	480	50	0	500	40	22	0	0	1,000	100	100	0	0
29......	6,920	7	110	20	10	30	32	7,300	900	500	31	0	510	60	30	0	0	10,000	100	100	1	0
Mean	6,184	5	160	22	9	33	33	10,900	1,440	870	90	1	570	75	35	0	0	4,720	190	63	0.4	0
March, 1924																					
1.......	6,500	7	100	12	8	33	33	4,400	1,200	400	100	0	400	30	12	0	0	10,000	1,000	100	2	0
2.......	5,890	7	125	20	10	34	30	8,800	1,400	1,100	100	0	540	200	100	0	0	1,000	100	100	2	0
3.......	5,850	7	100	20	10	35	32	6,000	1,000	700	100	0	770	100	50	0	0	1,000	100	10	0	0
4.......	5,530	6	110	20	8	35	29	4,200	1,200	1,400	200	0	500	40	40	0	0	1,000	100	10	0	0
5.......	6,020	6	110	12	4	37	32	4,800	1,300	900	75	0	400	100	50	0	0	1,000	100	10	2	0
6.......	3,930	6	70	12	4	40	40	4,800	550	300	12	0	480	38	14	0	0	1,000	100	10	0	0
7.......	5,940	7	60	12	4	39	43	3,800	1,000	1,000	70	0	600	50	22	0	0	1,000	100	100	0	0
8.......	5,990	7	100	30	10	32	45	30,000	4,100	3,200	270	1	970	100	50	0	0	1,000	100	100	3	0
9.......	5,130	7	275	20	10	29	35	24,000	5,000	3,000	380	10	700	100	30	0	0	10,000	1,000	100	3	0
10......	7,050	6	220	18	8	23	32	9,000	1,800	1,000	100	0	700	100	50	0	0	1,000	100	100	1	0
11......	5,490	7	200	22	10	20	17	12,000	3,000	2,000	120	0	900	90	40	0	0	1,000	100	10	1	0
12......	5,640	7	140	12	4	23	23	6,000	1,300	700	130	0	900	100	50	1	0	10,000	1,000	100	2	0
13......	5,560	7	100	12	4	18	17	6,100	1,400	1,500	200	0	600	60	40	0	0	1,000	100	100	2	0
14......	5,040	7	90	18	8	24	23	6,400	2,400	1,400	200	10	650	60	20	0	0	1,000	100	100	0	0
15......	5,330	8	110	12	4	22	21	9,500	2,300	1,300	350	0	400	70	21	0	0	1,000	100	10	0	0
16......	4,380	8	70	12	8	20	23	3,200	1,400	900	200	0	600	50	40	0	0	1,000	100	10	0	0
17......	5,710	8	60	18	8	25	24	3,800	1,600	800	70	0	270	34	60	1	0	1,000	100	10	0	0

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923–24—Continued

PORTSMOUTH (OHIO) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
March, 1924	*1,000 gallons*	*° C.*																				
18	5,870	8	85	20	10	29	28	3,700	450	400	52	0	300	45	20	0	0	1,000	100	10	0	0
19	5,210	8	80	12	4	35	38	4,500	600	250	40	0	340	40	20	0	0	1,000	100	100	1	0
20	4,950	8	100	20	10	38	39	9,000	1,200	900	70	1	300	38	40	0	0	10,000	1,000	100	2	0
21	5,480	7	120	20	8	40	37	23,000	1,900	1,300	300	4	600	40	20	1	0	10,000	1,000	100	0	0
22	5,790	8	140	38	12	65	61	24,000	2,500	2,000	325	7	1,000	75	30	0	0	10,000	1,000	100	0	0
23	4,580	8	320	20	10	70	63	35,000	2,800	2,100	270	3	1,300	150	100	0	0	10,000	100	100	0	0
24	5,760	9	220	28	12	54	49	24,000	2,800	1,700	120	0	800	120	40	0	0	10,000	1,000	100	2	0
25	5,580	9	175	20	8	35	35	12,000	2,100	1,200	160	0	500	60	28	0	0	1,000	100	10	0	0
26	5,730	9	90	10	4	34	31	9,000	1,300	750	28	0	300	42	18	0	0	10,000	100	100	0	0
27	5,290	9	70	28	12	25	22	7,000	1,200	500	31	0	320	50	18	0	0	1,000	100	100	1	0
28	5,220	9	135	18	8	24	23	12,000	1,400	1,200	175	0	500	50	20	0	0	1,000	100	100	0	0
29	5,830	10	120	18	10	40	37	40,000	6,500	3,200	410	0	1,200	180	70	0	0	10,000	1,000	100	3	0
30	4,630	9	275	24	10	36	34	100,000	7,500	2,800	170	0	1,900	300	135	1	0	10,000	100	10	1	0
31	5,880	9	900	45	18	34	30	60,000	4,400	2,800	220	0	2,400	370	100	0	0	10,000	100	100	1	0
Mean	5,510	8	158	20	9	34	33	16,000	2,200	1,190	155	1	675	90	40	0	0	4,480	332	68	0.9	0
April, 1924																						
1	5,610	-------	1,200	60	25	38	32	30,000	4,200	2,500	200	0	2,400	280	95	0	0	10,000	1,000	100	0	0
2	5,130	-------	650	30	10	49	37	19,000	2,000	2,100	250	0	1,900	230	50	0	0	10,000	1,000	100	1	0
3	5,710	-------	300	19	10	82	77	14,000	1,500	1,000	22	0	1,200	190	40	0	0	10,000	100	100	0	0
4	5,780	-------	220	28	15	40	57	10,000	1,400	600	25	0	1,600	200	80	0	0	10,000	100	100	0	0
5	6,230	-------	150	20	10	42	38	11,000	2,100	1,000	150	0	900	80	30	0	0	10,000	100	100	1	0
6	5,800	-------	100	18	6	40	38	9,000	1,800	1,000	90	0	1,000	180	70	0	0	1,000	100	100	0	0
7	5,630	-------	120	-------	20	38	36	10,000	-------	1,200	100	0	600	-------	140	0	0	1,000	-------	100	3	0
8	5,020	-------	100	-------	18	35	30	10,000	-------	2,000	250	0	350	-------	70	0	0	1,000	-------	100	3	0
9	5,060	-------	90	-------	18	34	24	8,000	-------	1,600	100	0	540	-------	130	0	0	1,000	-------	100	3	0
10	5,910	-------	80	10	4	35	30	5,800	900	480	40	0	350	50	20	0	0	1,000	100	100	2	0
11	5,730	-------	70	12	4	34	25	4,800	800	380	21	0	300	50	22	0	0	1,000	100	10	0	0
12	5,740	-------	60	12	4	32	28	2,700	600	240	12	0	180	20	8	0	0	1,000	100	10	1	0
13	5,760	-------	40	10	4	34	31	2,300	700	290	8	0	350	60	28	0	0	1,000	100	10	0	0
14	5,710	-------	40	10	4	35	32	3,200	480	220	12	0	300	28	12	0	0	1,000	100	10	0	0
15	5,710	-------	35	12	4	24	27	2,200	480	400	50	0	340	54	34	0	0	1,000	100	100	1	0
16	5,520	-------	40	8	5	25	27	2,400	290	200	18	0	280	18	10	0	0	1,000	100	10	0	0

17	5, 390	-------	40	10	5	29	28	3, 400	1, 000	700	110	0	300	40	34	1	0	1, 000	100	100	0	0
18	5, 560	-------	80	20	12	30	26	3, 800	500	300	29	0	480	70	40	1	0	10, 000	100	100	1	0
19	5, 370	-------	110	18	8	30	27	15, 000	2, 100	1, 200	130	0	750	100	38	0	0	10, 000	1, 000	100	2	0
20	4, 890	-------	90	20	8	30	25	11, 000	1, 800	800	100	0	550	180	100	0	0	10, 000	1, 000	100	2	0
21	5, 210	-------	70	15	7	31	27	12, 000	1, 250	1, 000	130	0	500	70	40	2	0	1, 000	1, 000	100	0	0
22	5, 670	-------	50	12	4	34	33	4, 000	375	200	5	0	450	40	12	0	0	1, 000	100	10	0	0
23	5, 720	-------	45	10	5	30	34	1, 800	100	40	3	0	900	38	14	0	0	1, 000	100	10	0	0
24	5, 810	-------	45	12	4	35	28	5, 400	780	700	35	1	900	100	60	0	0	1, 000	100	10	0	0
25	5, 800	-------	50	12	4	33	30	5, 100	1, 000	480	14	0	550	40	12	0	0	10, 000	100	100	0	0
26	5, 800	-------	40	8	4	29	26	3, 200	700	300	8	0	500	80	38	0	0	1, 000	100	10	0	0
27	4, 220	-------	45	15	5	32	28	2, 100	680	90	8	0	200	12	10	0	0	1, 000	100	10	0	0
28	5, 700	-------	40	8	4	35	33	2, 300	400	250	14	0	190	28	12	0	0	1, 000	100	10	0	0
29	5, 730	-------	45	10	4	33	32	3, 100	400	280	15	0	140	40	30	0	0	1, 000	10	10	0	0
30	5, 620	-------	40	10	5	35	32	3, 800	590	400	8	0	220	28	12	0	0	1, 000	100	10	0	0
Mean	5, 530	-------	136	16	8	36	32	7, 400	1, 100	650	62	0	600	79	40	0	0	3, 700	263	61	0. 7	0
May, 1924																					
1	5, 620	13	70	12	4	38	34	10, 000	1, 800	1, 100	40	0	700	100	40	0	0	1, 000	100	100	0	0
2	5, 650	13	130	18	8	43	37	8, 000	1, 100	480	22	0	900	180	100	1	0	1, 000	100	100	0	0
3	5, 730	14	140	20	10	48	42	11, 000	2, 100	1, 100	34	0	500	75	42	0	0	1, 000	100	100	0	0
4	4, 010	14	100	20	8	58	48	8, 300	1, 300	700	21	0	270	35	18	0	0	1, 000	100	10	0	0
5	5, 790	14	95	18	8	38	42	8, 500	1, 800	1, 200	100	0	175	22	10	0	0	1, 000	100	100	0	0
6	5, 310	14	90	20	8	32	30	7, 000	800	450	28	0	210	32	12	0	0	1, 000	100	100	0	0
7	5, 950	14	80	12	5	34	30	6, 800	1, 000	800	10	0	250	30	20	0	0	1, 000	100	10	0	0
8	5, 160	14	70	10	5	33	31	3, 300	400	230	31	0	160	18	8	0	0	1, 000	10	10	0	0
9	5, 410	14	70	12	4	34	32	2, 700	200	120	12	0	100	18	8	0	0	1, 000	10	10	0	0
10	4, 380	15	60	18	8	33	30	2, 000	280	300	20	0	70	12	7	0	0	1, 000	10	10	1	0
11	5, 770	15	70	12	5	37	31	3, 800	450	200	12	0	170	35	12	0	0	1, 000	10	10	0	0
12	5, 170	15	80	22	10	42	40	3, 200	220	100	8	0	250	30	15	0	0	1, 000	100	10	0	0
13	5, 400	15	160	18	12	48	43	4, 000	400	180	12	1	200	18	10	0	0	1, 000	100	100	1	0
14	5, 090	15	270	15	8	52	45	4, 400	700	480	10	0	600	180	110	0	0	1, 000	100	100	2	0
15	5, 630	15	290	28	12	44	38	14, 000	1, 000	375	4	0	1, 000	200	90	0	0	1, 000	100	100	2	0
16	5, 400	15	210	20	8	40	35	8, 000	720	400	12	0	600	100	48	0	0	1, 000	100	100	3	0
17	5, 490	16	175	12	4	40	34	6, 400	540	375	15	0	520	50	31	0	0	1, 000	100	100	0	0
18	5, 310	15	125	20	8	32	30	5, 400	400	210	10	0	650	60	35	0	0	1, 000	100	100	1	0
19	5, 570	16	110	12	5	28	30	6, 300	700	600	10	0	400	30	20	1	0	1, 000	100	100	1	0
20	5, 490	16	80	10	4	26	24	4, 400	480	200	0	0	900	70	34	1	0	1, 000	1, 000	100	2	0
21	6, 040	16	80	18	8	28	26	6, 000	400	300	1	0	700	55	25	0	0	1, 000	100	100	0	0
22	5, 320	16	70	8	6	30	25	3, 400	500	300	1	0	550	40	18	0	0	1, 000	100	100	1	0
23	5, 500	16	75	18	7	29	27	4, 000	500	190	10	0	770	85	40	0	0	1, 000	100	100	0	0
24	5, 530	16	70	10	4	30	27	4, 800	450	250	35	0	900	110	75	2	0	1, 000	100	100	2	0
25	4, 870	17	80	12	6	29	29	4, 200	750	500	31	0	650	75	30	0	0	1, 000	100	10	0	0
26	5, 230	16	90	14	5	30	27	4, 200	380	400	10	0	800	90	60	2	0	1, 000	100	10	0	0
27	5, 450	17	90	20	8	27	25	3, 600	500	500	22	0	750	100	45	0	0	1, 000	10	10	0	0
28	5, 450	17	85	18	4	29	27	4, 000	700	390	5	0	590	75	40	1	0	1, 000	100	100	2	0
29	4, 870	17	100	12	4	27	24	9, 000	1, 200	400	24	0	780	100	38	0	0	1, 000	100	100	1	0
30	5, 100	17	130	18	7	23	27	14, 000	900	500	3	0	1, 200	170	70	1	0	1, 000	100	10	2	0
31	4, 410	17	375	28	15	31	37	16, 000	1, 200	1, 000	13	0	2, 400	190	100	0	0	10, 000	1, 000	100	2	0
Mean	5, 345	15	115	16	7	35	32	6, 500	750	450	21	0	600	70	36	0	0	1, 290	144	68	0. 7	0

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923–24—Continued

PORTSMOUTH (OHIO) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water tem[illegible]	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
June, 1924	*1,000 gallons*	° *C.*																				
1	5,060	17	175	18	6	49	47	18.000	2,300	1,200	34	0	2,400	175	60	1	0	10,000	1,000	100	2	0
2	5,330	18	150	20	10	42	39	24,000	4,200	2,400	35	0	3,200	480	275	2	0	10,000	100	100	0	0
3	5,410	18	150	20	8	40	37	20,000	2,300	1,000	14	0	2,700	225	100	1	0	10,000	100	100	2	0
4	5,390	18	100	12	4	38	32	12,000	1,400	1,000	30	0	2,000	450	200	1	0	1,000	100	100	1	0
5	5,400	18	80	10	4	34	28	9,000	850	900	10	0	1,400	180	100	0	0	1,000	100	10	0	0
6	5,250	19	60	10	5	34	29	6,000	1,400	1,000	25	0	900	200	140	1	0	1,000	100	10	0	0
7	5,450	19	70	8	4	32	30	4,400	800	720	50	0	540	(5)	75	2	0	1,000	100	10	1	0
8	6,020	19	80	10	6	33	29	4,800	500	300	14	0	500	48	20	0	0	1,000	10	10	0	0
9	5,480	19	175	18	8	43	31	13,000	2,100	1,000	58	0	900	100	100	0	0	1,000	100	10	0	0
10	5,210	19	500	24	10	50	40	42,000	4,800	2,400	12	0	4,500	380	150	3	0	1,000	100	100	0	0
11	5,730	20	650	30	12	43	38	50,000	3,000	2,100	48	0	3,000	400	180	0	0	10,000	1,000	100	1	0
12	5,050	20	600	25	10	43	39	36,000	2,000	1,000	33	0	6,000	750	400	7	0	10,000	100	100	2	0
13	5,130	20	500	25	10	44	34	18,000	2,300	1,200	40	0	3,000	210	190	3	0	1,000	100	100	1	0
14	5,300	20	275	20	8	44	35	12,000	800	500	12	0	2,400	100	220	2	0	1,000	100	100	1	0
15	5,410	21	200	20	12	43	40	24,000	1,900	800	40	0	2,000	380	180	3	0	10,000	1,000	100	1	0
16	4,920	22	200	18	8	40	35	15,000	1,000	600	31	0	3,000	480	240	8	0	10,000	100	100	0	0
17	5,100	23	140	20	12	39	33	18,000	2,100	1,400	35	0	1,400	180	120	1	0	1,000	100	100	0	0
18	5,170	23	140	18	10	41	32	14,000	1,200	500	28	0	1,000	220	140	2	0	1,000	100	100	0	0
19	5,400	24	100	20	4	43	32	9,000	750	300	8	0	900	100	40	1	0	1,000	100	100	0	0
20	5,540	24	100	12	4	39	30	6,400	500	320	12	1	700	150	140	1	0	1,000	100	100	0	0
21	5,700	25	80	10	6	43	35	5,400	700	400	6	0	650	140	120	1	0	1,000	100	100	0	0
22	5,670	26	60	12	5	43	35	5,000	1,000	400	0	0	800	140	100	2	0	1,000	100	100	0	0
23	5,650	26	45	10	4	43	35	4,400	300	100	16	0	480	88	45	2	0	1,000	100	100	0	0
24	5,750	25	70	10	6	46	44	6,000	300	110	3	0	800	75	35	0	0	1,000	100	10	0	0
25	5,870	26	140	12	4	43	37	10,000	700	500	28	0	6,000	500	300	(5)	0	1,000	100	100	0	0
26	5,660	26	135	12	4	41	38	5,100	850	400	38	1	3,600	300	180	5	0	1,000	100	10	0	0
27	5,540	26	140	20	10	43	40	8,000	1,000	500	28	0	1,400	300	350	10	0	1,000	1,000	100	1	0
28	5,320	26	170	18	12	42	40	8,900	1,000	450	21	0	2,300	400	190	12	0	1,000	100	100	1	0
29	4,940	26	230	20	8	41	39	9,000	1,200	1,000	50	0	3,400	500	500	21	1	10,000	1,000	100	4	0
30	5,380	26	1,300	40	18	43	35	18,000	1,200	750	80	0	6,000	850	300	5	0	10,000	1,000	100	3	0
Mean	5,408	22	224	17	8	41	36	14,500	1,500	900	28	0	2,300	300	170	2	0	3,700	277	79	0.7	0

July, 1924																						
1	4,400	25	1,400	40	25	48	29	33,000	4,200	2,200	100	1	4,800	550	200	15	0	10,000	100	100	3	0
2	4,470	25	500	28	12	42	35	36,000	3,000	2,200	--------	2	4,200	700	1,000	4	0	10,000	1,000	100	1	0
3	4,980	25	450	15	10	34	28	20,000	3,300	1,800	75	0	2,300	400	800	10	0	10,000	100	100	1	0
4	5,400	24	320	18	8	30	26	16,000	1,200	1,000	70	0	3,100	400	470	23	1	10,000	100	100	1	0
5	5,770	23	300	18	8	30	26	9,000	1,000	900	30	0	2,400	500	500	12	0	10,000	100	100	0	0
6	5,530	23	250	15	8	32	32	6,000	1,200	800	70	0	2,100	400	470	23	1	10,000	1,000	100	1	0
7	5,460	23	260	50	20	34	26	5,900	1,700	970	19	0	1,520	1,020	960	14	0	10,000	1,000	100	0	0
8	5,310	23	220	24	15	37	40	4,000	545	450	18	0	1,640	740	670	6	0	1,000	100	100	0	0
9	5,420	24	300	24	10	42	35	2,900	430	255	7	0	1,640	270	190	4	0	1,000	100	100	0	0
10	5,060	24	210	24	10	40	36	4,400	590	500	18	0	1,160	300	210	5	0	10,000	100	100	0	0
11	5,170	24	150	20	10	41	36	5,100	700	510	18	0	1,050	280	200	4	0	10,000	100	100	2	0
12	5,490	24	150	18	8	37	33	4,400	520	390	10	0	990	180	150	2	0	10,000	100	100	2	0
13	5,410	24	180	18	10	37	29	7,200	1,000	820	41	1	1,610	220	190	4	0	10,000	1,000	100	0	0
14	5,520	25	210	18	8	35	28	6,400	800	620	28	2	1,350	280	220	2	0	1,000	100	100	2	0
15	5,280	25	170	22	10	38	30	6,000	400	400	12	0	1,100	280	200	1	0	1,000	100	10	4	0
16	5,400	25	150	12	8	37	28	6,300	380	300	14	0	800	180	120	3	0	1,000	100	100	4	0
17	5,700	24	125	20	10	36	31	7,000	500	700	55	2	1,100	190	300	5	0	1,000	100	100	2	0
18	5,800	25	100	12	5	39	39	3,400	300	220	15	1	600	120	100	2	0	1,000	1,000	100	0	0
19	5,360	26	90	10	5	39	39	2,100	200	50	4	0	900	100	70	1	0	1,000	10	10	2	0
20	5,290	26	100	18	6	40	41	800	100	40	4	0	500	140	70	2	0	1,000	100	100	3	0
21	5,650	27	70	10	6	40	41	2,100	250	300	38	1	1,300	200	230	12	2	1,000	1,000	100	2	0
22	5,200	28	30	7	5	41	43	2,000	180	150	12	0	480	120	100	3	0	1,000	100	100	2	0
23	5,240	27	30	10	5	41	42	2,400	290	210	10	0	700	90	100	0	0	1,000	100	100	2	0
24	5,400	28	20	7	3	41	42	3,000	480	320	30	1	750	110	100	1	0	1,000	100	100	4	0
25	5,750	28	15	8	3	40	40	3,800	280	200	18	2	900	120	100	1	0	1,000	1,000	100	5	0
26	5,620	28	12	6	3	42	44	1,600	200	140	9	0	700	110	70	0	0	10,000	1,000	100	0	0
27	5,200	29	15	6	4	40	44	1,500	200	200	12	0	420	127	100	5	0	10,000	1,000	1,000	0	0
28	5,800	29	10	6	4	41	46	1,800	145	110	5	0	860	60	50	0	0	10,000	1,000	100	0	0
29	5,750	28	10	5	4	42	47	1,200	150	120	15	0	900	140	120	15	0	1,000	100	100	2	0
30	5,800	28	12	4	3	41	45	800	160	120	15	0	1,000	200	150	4	0	10,000	1,000	100	2	0
31	6,250	28	10	5	4	40	45	670	140	100	10	0	700	120	100	4	0	1,000	1,000	1,000	5	0
Mean	5,420	25	190	16	8	38	36	6,600	800	550	26	0.4	1,400	280	260	6	0.1	5,350	445	152	1.7	0

CINCINNATI (OHIO) WATER FILTRATION PLANT

July, 1923																						
1	46,409	--------	170	44	20	37	43	1,800	390	60	1	3	1,110	200	55	0	4	1,000	100	10	10	0
2	49,160	--------	200	50	18	31	42	3,100	570	100	1	15	1,660	310	125	7	10	1,000	100	10	10	0
3	55,695	--------	200	65	19	35	42	2,400	590	75	2	4	--------	--------	--------	--------	--------	1,000	1,000	10	0	0
4	45,473	--------	130	50	17	30	41	2,200	600	125	1	6	1,650	790	85	2	2	100	100	10	0	0
5	49,540	--------	115	35	15	31	39	2,500	260	65	1	3	3,650	800	510	5	29	1,000	100	100	0	0
6	52,927	--------	260	24	15	31	39	5,200	160	35	2	7	1,850	110	57	3	2	1,000	100	10	0	0
7	50,051	--------	320	24	15	31	38	12,000	1,850	95	3	7	--------	--------	--------	--------	--------	10,000	100	10	0	0
8	46,292	--------	240	50	13	32	38	7,600	990	130	3	8	1,320	230	54	2	3	10,000	100	10	0	0
9	52,762	--------	400	75	15	44	40	3,900	765	185	2	18	1,550	330	100	5	6	10,000	1,000	100	0	2

[8] Spreader.

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923–24—Continued

CINCINNATI (OHIO) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 cubic c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
July, 1923	*1,000 gallons*	*° C.*																				
10	56, 836	....	620	140	18	53	43	4, 200	845	100	13	7	2, 100	780	115	3	7	1, 000	10	1, 000	10	2
11	55, 888	....	640	175	16	48	46	10, 000	1, 800	140	1	28	1, 800	480	80	3	15	10, 000	10	10	0	0
12	55, 098	....	350	120	21	34	47	4, 000	1, 150	110	8	20	900	130	100	6	27	100	1, 000	10	0	0
13	56, 574	....	300	110	18	30	45	8, 000	1, 950	90	3	29	900	390	80	2	31	1, 000	1, 000	0	0	0
14	56, 651	....	560	140	20	37	44	6, 000	1, 850	95	2	13						10, 000	1, 000	100	0	0
15	45, 979	....	760	135	18	37	43	15, 000	1, 150	200	1	89	3, 600	860	50	1	65	1, 000	1, 000	10	0	0
16	53, 100	....	1, 300	165	19	32	43	18, 000	600	75	3	210	5, 000	570	50	0	50	1, 000	100	10	0	2
17	62, 842	....	760	145	16	32	42	5, 000	950	65	2	110	1, 100	200	20	1	43	1, 000	100	10	0	0
18	62, 495	....	500	120	16	36	42	21, 000	1, 000	45	2	115	900	210	30	1	15	1, 000	1, 000	10	0	0
19	56, 059	....	310	100	16	41	43	1, 000	800	40	1	130	1, 300	230	60	10	28	1, 000	[illegible]	10	0	0
20	56, 955	....	190	80	22	37	42	1, 000	345	35	5	15	700	230	20	2	40	100	100	100	0	0
21	62, 580	....	160	65	22	32	41	400	760	50	1	210						100	100	100	0	2
22	46, 535	....	170	85	17	35	42	1, 800	570	60	2	320	1, 350	1, 300	65	7	300	100	10	10	0	6
23	58, 698	....	370	90	23	38	41	1, 100	175	100	8	85	660	140	10	2	35	1, 000	1, 000	10	0	0
24	61, 219	....	380	105	21	42	43	600	90	10	1	270	290	50	30	2	155	100	10	100	0	0
25	54, 579	....	340	100	19	42	43	600	200	35	1	250	610	360	28	3	210	1, 000	10	10	0	0
26	55, 120	....	270	100	19	41	44	900	210	30	2	1	510	100	23	1	0	10, 000	100	10	0	0
27	55, 132	....	200	95	21	42	43	1, 400	315	35	2	140	540	170	70	6	60	100	100	10	0	2
28	54, 072	....	210	95	20	47	46	800	255	25	2	105						1, 000	100	100	0	4
29	43, 828	....	160	85	23	43	46	1, 100	350	45	4	260	820	420	35	5	50	100	100	10	0	0
30	55, 499	....	240	85	24	42	45	4, 100	720	50	1	305	1, 800	460	85	3	170	100	100	10	0	0
31	57, 567	....	500	100	23	37	46	3, 100	500	55	0	150	2, 300	650	95	2	90	1, 000	100	10	0	0
Mean	54, 000	....	365	90	19	38	43	4, 830	735	75	3	95	1, 540	400	80	3	55	2, 480	318	62	1	0. 6
Aug., 1923																						
1	56, 447	....	270	95	24	37	45	2, 000	800	325	1	170	1, 450	750	60	1	75	100	10	10	0	0
2	58, 195	....	290	95	23	35	43	1, 900	700	140	4	250	1, 800	600	110	3	40	1, 000	100	10	0	0
3	59, 463	....	420	105	23	36	42	1, 000	750	170	4	220	1, 100	650	110	1	140	1, 000	100	10	0	0
4	50, 874	....	410	110	25	37	42	6, 400	750	45	1	110						1, 000	1, 000	100	0	4
5	45, 155	....	600	115	27	41	43	9, 000	700	110	2	550	1, 300	275	40	2	550	100	100	10	0	0
6	58, 201	....	680	130	26	38	42	12, 000	300	95	4	475	2, 400	400	90	1	250	1, 000	100	10	0	0
7	56, 773	....	600	160	24	29	42	8, 000	1, 000	70	1	350	3, 200	550	60	0	325	1, 000	100	100	0	0

8	64,201	28	600	125	24	30	41	8,000	600	45	1	120	2,900	350	140	0	....	100	100	100	0	0
9	60,477	....	1,050	145	24	28	38	5,000	500	25	4	50	2,200	380	50	2	44	10,000	100	100	0	0
10	48,415	....	900	135	18	27	38	7,000	1,200	65	4	90	2,100	950	70	2	120	1,000	10	100	10	0
11	56,220	....	900	135	25	35	37	4,000	1,300	120	13	40	2,800	750	150	3	48	1,000	10,000	100	10	6
12	43,781	....	630	145	27	36	38	5,000	1,100	150	4	60	1,600	950	120	2	27	1,000	100	1,000	10	0
13	55,208	....	820	150	27	43	38	2,000	1,200	130	14	30	2,800	400	220	35	6	1,000	1,000	100	10	0
14	63,684	....	1,050	175	25	48	42	10,000	1,200	75	4	14	5,700	675	80	5	15	1,000	1,000	100	10	0
15	59,271	....	1,450	190	21	36	43	10,000	600	50	9	65	3,600	325	50	3	3	10,000	10,000	100	10	0
16	56,555	....	1,150	185	19	34	41	3,000	600	60	2	17	3,700	1,200	70	4	130	10,000	100	10	0	4
17	52,204	....	1,100	175	22	21	39	11,000	1,300	55	2	10	1,300	700	150	4	22	10,000	1,000	10	0	0
18	49,062	....	760	165	28	24	39	3,000	1,700	90	3	13	3,800	550	110	5	24	1,000	100	100	0	4
19	56,646	....	350	155	28	35	37	3,200	1,100	110	9	1	2,600	850	120	2	3	10,000	1,000	100	0	0
20	53,261	....	310	160	28	33	36	2,800	1,200	120	7	95	3,300	475	80	7	28	1,000	100	100	0	0
21	62,869	....	250	155	27	34	35	1,400	950	120	9	90	1,300	350	50	8	90	10,000	100	100	0	2
22	52,049	....	1,000	185	33	39	36	75,000	3,200	375	13	120	4,900	1,100	425	16	180	100,000	100	100	0	0
23	48,767	....	1,100	235	29	41	38	20,000	2,400	350	15	28	17,000	1,300	190	7	90	10,000	10,000	100	10	6
24	50,791	....	620	295	29	46	40	24,000	4,500	425	24	33	21,000	2,200	220	16	5	100,000	100	1,000	10	10
25	47,707	....	370	260	32	47	44	11,000	4,100	500	27	23						100	10,000	100	0	0
26	46,972	....	180	220	30	42	46	7,000	4,000	500	27	20	3,000	2,700	375	16	40	1,000	1,000	100	10	0
27	49,900	....	280	210	27	43	47	8,000	2,700	475	12	500	4,300	1,900	350	20	450	10,000	100	100	0	0
28	55,978	....	190	165	22	46	47	2,800	2,200	180	4	13	1,200	675	350	40	550	1,000	1,000	10	0	0
29	48,016	....	170	135	24	44	48	8,500	2,500	250	6	170	2,100	1,100	450	35	400	10,000	100	10	0	4
30	54,318	....	150	115	23	46	49	2,200	850	210	10	170	1,800	850	275	7	65	1,000	100	10	10	2
31	54,273	....	240	110	22	46	49	4,000	1,500	210	9	300	2,600	700	325	11	200	10,000	1,000	100	0	0
Mean	54,057	....	610	160	25	37	41	8,970	1,550	180	8	135	3,750	850	170	9	140	10,200	1,600	129	3.2	1.4
Sept., 1923																					
1	54,582	....	140	105	21	47	49	3,800	1,000	220	5	120	3,100	1,400	600	50	250	1,000	1,000	100	4	0
2	48,028	....	110	95	17	45	49	2,500	650	140	4	140	900	270	400	11	140	100	100	1,000	4	0
3	43,461	....	90	50	22	44	49	1,400	900	150	4	320	1,100	340	60	9	170	100	100	10	0	0
4	51,536	....	95	50	23	37	47	600	800	150	4	220	2,000	270	150	7	1,300	100	10	10	4	0
5	54,615	....	260	47	23	38	46	2,600	300	120	3	270	1,100	140	160	24	2,000	100	100	100	0	4
6	59,765	....	130	45	24	37	43	1,600	750	240	3	85	1,500	480	180	22	600	1,000	10	100	2	0
7	54,494	26	110	50	19	46	44	1,300	950	220	5	220	3,400	750	280	10	450	100	1,000	100	2	10
8	51,064	....	170	50	19	50	45	7,200	1,000	260	5	450	8,700	900	380	34	2,800	1,000	1,000	100	0	0
9	43,730	....	125	65	24	50	48	2,900	1,000	270	3	180	2,300	950	170	4	900	100	100	1,000	0	0
10	49,972	....	120	70	20	45	48	2,400	750	280	9	160	3,500	1,300	400	26	1,500	10,000	1,000	100	4	0
11	61,056	....	90	50	19	43	47	1,100	610	160	5	16	1,300	1,000	300	12	43	1,000	100	100	4	0
12	55,519	25	80	42	17	39	47	1,200	450	140	3	5	2,000	680	220	35	20	1,000	100	10	0	0
13	55,481	....	70	44	18	40	47	500	180	80	2	5	1,100	510	240	9	35	100	10	10	2	0
14	56,321	....	90	43	16	39	45	400	160	70	3	16	1,200	290	90	4	74	1,000	100	10	0	0
15	46,985	....	50	35	18	40	46	200	150	65	1	8	1,000	250	90	13	64	100	100	0	4	0
16	46,688	....	25	30	17	43	45	100	220	50	2	2	210	100	16	10	6	10	10	10	0	0
17	55,564	....	28	27	14	52	46	300	65	30	4	1	480	170	70	19	9	100	10	10	6	0
18	55,841	22	28	25	11	52	49	100	90	15	2	4	70	70	20	3	1	10	10	10	4	0
19	55,390	....	45	19	12	52	48	100	120	7	2	1	120	110	41	9	5	10	10	100	0	0
20	49,415	....	51	17	10	51	48	140	155	65	7	5	300	70	35	7	1	100	10	0	4	0
21	57,098	....	23	18	9	53	48	460	130	80	29	2	310	180	125	22	13	10	10	0	2	0
22	50,048	22	30	19	10	50	48	300	100	95	12	1	430	110	59	40	51	10	10	0	0	0
23	46,171	....	19	14	8	53	50	160	140	320	20	1	60	80	165	36	0	100	100	0	2	0
24	51,872	....	55	13	11	58	52	170	190	240	14	1	80	70	....	37	2	100	10	10	0	0

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923–24—Continued

CINCINNATI (OHIO) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 cubic c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Sept., 1923	*1,000 gallons*	*° C.*																				
25	55,446	-------	90	13	12	51	50	800	110	1,050	8	2	600	150	530	25	7	10	100	100	0	0
26	60,239	24	100	18	12	51	48	2,300	140	250	4	8	420	140	280	16	8	100	10	10	0	0
27	53,948	-------	330	19	13	43	50	400	250	180	7	5	600	270	430	21	8	100	100	0	0	0
28	54,732	-------	100	18	8	45	48	400	270	180	1	3	1,100	240	680	15	63	100	100	10	0	0
29	51,824	24	70	27	14	43	49	700	220	460	5	7	900	380	750	12	70	1,000	10	0	2	0
30	45,630	-------	100	52	21	45	49	5,100	900	550	6	50	500	530	1,150	15	30	1,000	1,000	100	6	0
Mean	52,550	24	95	39	16	46	48	1,375	425	205	6	75	1,350	405	280	19	355	652	211	104	1.9	0.5
Oct., 1923																						
1	53,174	23	170	55	20	47	47	2,300	500	350	17	29	800	160	200	11	12	1,000	1,000	100	8	0
2	54,913	-------	70	35	22	47	48	300	250	95	11	17	200	180	70	9	10	100	100	100	8	0
3	52,817	-------	60	30	17	46	48	500	220	75	5	18	100	150	130	16	37	1,000	1,000	10	2	0
4	56,070	-------	40	18	15	49	49	160	250	105	13	9	190	170	190	13	9	100	10	10	2	0
5	55,367	20	50	18	14	48	49	380	270	85	8	6	220	100	100	12	1	10	100	10	0	0
6	45,583	-------	60	16	12	57	50	600	380	75	17	3	1,110	250	150	15	4	10	100	10	0	0
7	45,480	-------	35	17	12	53	53	480	460	110	9	1	80	80	10	3	1	1,000	10	0	0	0
8	52,599	-------	35	17	14	51	54	440	90	90	11	1	190	210	20	4	0	100	10	0	0	0
9	52,920	19	38	16	15	51	[illegible]	750	150	50	4	2	180	70	70	1	1	100	10	10	4	0
10	61,840	-------	34	14	14	50	54	410	150	100	10	0	150	290	50	13	13	100	10	10	0	0
11	58,947	-------	16	15	13	49	54	1,500	105	100	4	1	280	140	60	4	1	100	10	10	0	0
12	58,184	19	18	11	13	47	54	830	175	80	12	0	80	60	20	6	0	100	100	10	0	0
13	53,459	-------	30	12	13	43	54	1,220	75	35	12	2	60	80	50	40	0	10	10	0	0	0
14	43,410	-------	32	14	15	46	53	340	70	60	2	1	40	30	40	2	2	10	10	10	0	0
15	50,337	-------	35	11	15	49	52	260	70	80	8	2	20	70	30	6	0	10	100	0	0	0
16	54,307	18	35	10	15	50	53	350	65	70	6	2	60	30	40	8	8	10	100	10	0	0
17	53,373	-------	32	10	13	49	52	140	70	85	2	2	110	40	80	7	0	10	100	0	0	0
18	54,212	-------	22	13	15	50	54	110	195	60	6	2	40	110	20	7	1	10	100	10	0	0
19	50,688	-------	75	11	13	52	53	150	145	150	13	5	110	130	70	8	5	10	100	10	2	0
20	48,534	-------	38	12	14	53	54	150	190	140	5	4	70	100	60	13	2	1,000	10	0	0	0
21	47,187	-------	34	11	17	54	55	190	150	150	19	1	10	20	10	0	2	10	10	0	4	0
22	50,187	-------	32	12	15	53	56	280	200	120	12	2	110	40	80	8	0	10	10	10	0	0
23	57,954	16	31	12	16	61	57	130	45	55	8	2	30	100	60	1	1	100	10	10	0	0

24	54, 557	-------	32	11	16	60	59	160	90	95	21	2	60	30	30	4	1	10	100	100	0	0
25	49, 516	-------	28	11	16	62	59	80	85	85	19	2	60	50	70	10	0	10	10	0	0	0
26	60, 438	14	18	12	17	64	59	300	45	35	11	0	10	10	10	1	0	10	100	10	0	0
27	48, 580	-------	15	13	13	66	61	100	65	55	12	4	80	35	25	3	1	10	10	0	0	0
28	44, 346	-------	10	11	15	66	64	300	190	100	37	2	45	28	18	12	0	100	10	0	0	0
29	46, 577	-------	15	10	13	66	64	290	220	55	18	4	30	32	17	3	2	100	10	10	0	0
30	48, 206	14	10	9	11	70	65	520	120	110	24	7	28	23	16	4	0	100	10	10	0	0
31	48, 502	-------	5	5	10	74	67	390	250	150	21	2	22	18	20	8	0	10	10	10	0	0
Mean	52, 008	18	37	15	15	54	55	455	170	95	12	4	150	90	60	8	4	170	106	15	1	0
Nov., 1923																						
1	50, 376	-------	8	5	10	63	68	380	110	90	22	3	45	32	23	11	1	10	10	10	2	0
2	50, 506	13	8	4	8	62	67	200	100	50	21	5	12	12	10	3	4	10	10	0	4	0
3	48, 489	-------	5	5	10	66	66	160	120	75	19	3	22	49	22	10	0	10	10	10	4	0
4	49, 975	-------	7	4	6	63	67	100	150	75	20	5	18	28	14	14	0	10	10	0	0	0
5	45, 978	-------	9	7	8	71	67	160	220	120	70	3	-------	-------	-------	-------	-------	10	10	0	2	0
6	48, 924	12	10	7	9	60	67	180	170	70	23	1	19	13	2	4	0	10	100	10	0	0
7	50, 394	-------	12	5	9	55	65	310	70	75	11	8	49	15	4	7	0	1,000	10	10	0	0
8	53, 654	-------	45	9	9	57	65	700	110	100	21	1	140	12	10	2	0	10	10	0	2	0
9	49, 757	11	145	22	13	48	64	2, 400	400	75	13	4	690	30	17	1	1	100	10	10	2	0
10	46, 553	-------	180	25	10	47	63	3, 100	600	160	18	1	1, 700	100	38	4	0	1, 000	100	10	0	0
11	39, 328	-------	120	17	12	52	62	3, 300	500	220	21	5	300	60	8	0	1	1, 000	100	10	10	0
12	47, 696	-------	175	30	15	54	61	3, 500	420	220	23	1	400	210	43	2	1	1, 000	100	100	4	0
13	46, 093	11	80	25	16	51	60	1, 900	450	260	33	2	300	40	18	0	0	100	100	100	0	0
14	44, 184	-------	70	26	18	51	60	400	460	175	31	0	200	90	38	2	0	100	100	10	2	0
15	40, 554	-------	60	21	17	53	59	3, 100	440	130	22	0	310	110	15	5	0	1, 000	100	100	0	0
16	43, 726	10	65	21	18	47	59	1, 200	320	350	40	2	100	60	30	1	0	100	100	100	8	0
17	42, 609	-------	50	20	16	45	59	200	350	220	65	1	180	170	58	12	1	100	100	100	4	0
18	38, 851	-------	38	19	17	45	59	1, 150	500	330	70	1	30	50	12	1	1	10	100	10	2	0
19	51, 961	-------	45	22	20	45	57	510	330	170	50	0	110	70	23	2	0	100	100	10	4	0
20	52, 577	9	40	19	17	46	56	530	340	170	22	1	10	40	8	0	0	100	10	10	4	0
21	51, 622	-------	35	19	15	45	56	700	380	220	14	1	160	80	36	2	0	1, 000	10	10	4	0
22	48, 763	-------	37	19	15	44	55	490	260	150	39	0	50	20	6	0	0	100	10	10	0	0
23	46, 611	8	38	19	17	42	54	880	360	160	55	4	30	20	11	3	0	1, 000	10	10	2	0
24	47, 551	-------	43	17	17	40	53	690	550	340	49	4	120	150	46	2	0	100	10	100	4	0
25	42, 939	-------	28	14	12	35	51	560	550	390	37	3	30	30	6	0	0	100	10	100	2	0
26	47, 518	8	90	20	18	40	50	1, 200	360	200	39	3	130	20	8	2	0	100	10	0	2	0
27	50, 678	-------	150	27	20	37	51	890	690	110	29	5	490	110	33	4	0	1, 000	100	100	0	0
28	48, 618	-------	145	35	20	41	50	5, 300	650	290	25	1	1, 360	40	20	2	0	1, 000	100	1, 000	2	0
29	46, 946	-------	120	30	19	34	48	2, 100	1, 280	910	125	3	480	150	41	0	2	100	100	10	8	0
30	43, 070	8	125	23	15	39	48	2, 700	1. 000	850	130	2	420	130	21	0	0	1, 000	100	10	6	0
Mean	47, 323	10	66	18	14	49	59	1. 300	410	225	38	2	275	67	21	3	0. 4	376	55	65	2. 8	0
Dec., 1923																						
1	45. 329	-------	140	24	17	32	49	3, 500	1. 000	360	47	0	350	120	72	6	1	1. 000	100	10	2	2
2	40. 329	-------	100	21	15	26	47	12, 600	1, 650	1. 000	52	1	200	30	30	0	0	1, 000	100	10	2	0
3	39, 497	-------	100	24	15	32	46	7, 500	1. 050	550	75	1	200	80	10	1	1	100	100	100	2	0
4	49, 691	-------	140	26	18	34	46	16, 500	1, 300	490	43	1	720	130	42	3	1	1, 000	100	100	2	0
5	49, 190	-------	270	36	18	37	44	10, 200	3, 350	1, 160	225	0	570	60	55	0	0	1, 000	100	100	4	0

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923–24—Continued

CINCINNATI (OHIO) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 cubic c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Dec., 1923	*1,000 gallons*	*° C.*																				
6	49,426	....	450	52	20	33	43	67,000	4,300	2,300	400	1	1,200	230	100	3	0	100	100	10	2	0
7	47,280	....	600	50	18	34	42	55,000	4,700	4,700	540	4	2,000	140	70	20	1	1,000	100	10	6	0
8	46,660	....	500	68	18	32	42	84,000	9,700	1,900	290	3	2,700	240	50	3	0	1,000	100	0	0	0
9	37,165	....	400	85	23	31	41	59,000	5,500	2,000	180	1	1,900	40	40	1	0	10,000	10	10	4	0
10	46,926	....	430	95	22	34	40	100,000	10,300	1,500	280	1	3,200	140	60	13	1	10,000	1,000	10	4	0
11	47,800	8	400	100	20	36	40	42,000	8,200	2,300	220	1	600	240	50	0	0	1,000	1,000	100	4	0
12	51,843	....	390	110	21	35	40	30,000	7,800	1,050	130	3	2,100	150	60	4	0	1,000	1,000	10	2	0
13	47,311	....	330	85	23	28	41	19,000	8,200	1,100	170	1	1,200	230	70	0	1	10,000	1,000	10	4	0
14	47,725	....	380	95	20	33	40	120,000	12,000	1,300	190	1	1,100	230	20	0	0	10,000	1,000	100	4	0
15	46,973	....	300	85	18	30	41	66,000	3,700	600	95	2	800	510	80	9	0	1,000	100	100	4	0
16	41,236	....	160	90	22	28	41	18,000	3,300	540	55	0	300	40	10	0	0	1,000	100	100	4	0
17	47,465	....	175	90	25	29	40	35,000	3,900	640	60	0	500	400	20	5	0	1,000	1,000	100	0	0
18	50,264	7	175	93	25	25	39	31,000	5,400	320	55	1	100	120	18	0	0	1,000	100	100	4	0
19	49,392	....	185	65	21	27	38	62,000	4,100	750	62	1	800	150	45	3	0	1,000	100	10	4	0
20	48,219	....	230	65	22	29	39	19,000	7,500	1,300	85	0	440	30	14	1	0	1,000	1,000	100	2	0
21	49,900	....	250	80	26	31	38	118,000	7,500	440	120	1	210	70	15	1	0	1,000	1,000	100	10	0
22	47,013	....	210	65	26	30	38	90,000	5,300	1,000	110	2	1,200	300	72	4	0	10,000	100	100	10	0
23	43,474	....	220	70	26	38	38	40,000	9,200	950	130	1	600	140	29	0	0	10,000	1,000	100	4	0
24	42,961	6	250	90	28	40	39	60,000	12,000	1,100	100	2	300	20	18	0	0	1,000	1,000	100	0	0
25	42,313	....	230	85	28	35	40	58,000	6,200	570	100	0	100	30	6	0	1	10,000	100	10	4	0
26	45,531	....	330	95	22	33	40	58,000	3,500	900	105	1	100	140	34	0	0	10,000	100	10	8	0
27	47,167	....	480	100	26	30	39	35,000	6,800	1,300	90	2	900	150	25	1	0	1,000	100	10	2	0
28	47,278	5	440	115	27	31	40	106,000	6,600	800	220	1	400	100	27	2	0	10,000	1,000	100	8	0
29	45,898	....	450	105	29	25	41	67,000	5,200	1,070	100	5	600	50	0	0	0	1,000	1,000	1,000	8	0
30	43,677	....	190	90	23	26	40	13,000	7,300	330	51	3	100	40	40	1	0	1,000	100	10	4	0
31	44,080	....	650	90	21	30	39	66,000	9,800	380	70	11	1,300	110	25	2	1	1,000	100	10	4	0
Mean	46,065	6	310	75	22	32	41	50,600	6,000	1,120	145	2	865	145	39	3	0.3	3,560	445	85	3.9	0.06
Jan., 1924																						
1	44,417	....	250	80	22	28	40	36,000	4,600	310	35	2	200	30	6	0	0	100	100	100	0	0
2	46,567	....	280	95	22	23	38	41,000	4,300	380	43	1	400	30	7	1	0	1,000	1,000	10	6	0
3	43,936	6	510	125	25	21	36	64,000	10,000	330	65	1	700	180	10	2	0	1,000	10	10	4	0

4	47,083	6	540	130	23	20	35	69,000	14,300	600	95	1	1,000	200	30	0	1	10,000	100	10	8	0
5	48,997	5	580	125	30	20	36	34,000	2,900	600	130	2	3,300	200	260	35	1	10,000	100	100	10	0
6	43,140	4	330	120	23	18	33	35,000	3,900	340	120	32	100	20	2	1	0	1,000	100	100	8	0
7	49,529	3	360	120	28	20	35	22,000	3,700	370	60	1	300	80	10	4	1	1,000	1,000	100	8	0
8	56,364	3	320	130	25	16	32	5,000	3,600	580	75	1	90	43	5	0	0	100	100	100	10	0
9	56,822	3	270	120	24	17	32	9,000	2,900	360	105	1	90	50	4	1	0	100	100	100	8	0
10	50,000	3	250	105	22	17	31	6,000	1,450	360	80	1	50	32	33	1	1	100	100	100	2	0
11	46,966	3	330	115	21	24	31	55,000	1,500	280	80	0	140	95	4	0	0	1,000	10,000	10	8	0
12	49,094	3	300	125	22	31	31	9,000	2,800	150	46	0	340	85	15	2	0	100	100	10	8	0
13	43,157	3	330	125	21	29	34	26,000	4,800	110	30	0	210	50	1	0	0	1,000	100	10	2	0
14	47,346	3	500	145	24	24	35	49,000	3,500	230	65	5	310	50	4	0	0	100	100	100	6	2
15	55,244	3	720	175	24	28	32	34,000	4,900	1,090	155	1	160	52	6	1	0	1,000	1,000	10	8	0
16	52,442	3	580	140	23	27	32	47,000	7,000	1,100	135	0	60	52	6	1	0	100	100	100	6	0
17	45,849	3	450	150	23	22	33	30,000	16,500	1,350	250	1	110	75	5	1	0	100	100	100	8	0
18	50,035	3	270	155	22	18	33	47,000	11,800	1,100	260	0	30	36	3	0	0	100	10,000	100	10	0
19	47,555	3	330	150	20	20	31	10,000	14,700	1,100	105	2	1,080	150	125	15	0	10,000	1,000	100	6	0
20	45,384	2	510	135	19	21	31	68,000	20,000	1,850	320	3	40	100	8	0	0	10,000	1,000	10	2	0
21	47,971	2	1,000	160	27	24	32	11,000	6,500	2,800	290	0	88	115	55	3	1	1,000	1,000	10	8	0
22	55,529	2	580	180	20	18	33	90,000	3,000	450	130	3	400	56	48	0	0	1,000	1,000	10	0	0
23	54,158	2	330	165	18	17	32	4,000	800	255	75	1	260	85	9	2	0	1,000	100	1,000	4	0
24	54,019	2	250	130	20	19	31	2,000	3,850	500	85	2	250	170	14	2	1	100	100	10	0	0
25	51,972	2	250	135	17	17	30	40,000	5,500	940	190	2	860	200	22	8	2	1,000	100	100	6	0
26	45,870	2	270	140	24	24	30	8,300	3,500	850	180	20	280	120	24	0	0	100	100	10	0	0
27	50,061	2	125	110	20	25	32	100	430	220	40	2	90	130	16	1	1	10,000	100	100	2	0
28	49,443	2	145	105	23	28	32	100	1,750	650	55	2	180	125	13	4	0	100	1,000	10	8	0
29	56,249	2	110	90	24	26	33	300	1,480	440	50	1	180	200	43	1	0	1,000	100	100	2	0
30	50,797	2	175	90	18	30	32	3,200	1,040	270	45	1	150	61	13	1	0	1,000	1,000	100	0	0
31	49,706	2	135	90	22	28	32	500	850	320	70	3	60	46	41	3	3	1,000	100	100	8	0
Mean	49,308	3	370	130	22	23	33	27,600	5,400	650	115	3	370	95	27	3	0.4	2,100	997	91	5.4	0.06
Feb., 1924																						
1	51,484	2	100	75	23	37	35	2,200	2,300	1,050	55	3	60	30	7	1	0	100	100	100	0	0
2	46,024	2	90	70	23	30	36	10,800	3,250	1,400	210	3	460	115	74	3	2	1,000	1,000	10	2	0
3	45,555	2	150	70	21	43	37	18,000	1,800	1,300	170	1	200	26	5	3	0	1,000	100	10	6	2
4	46,940	2	110	60	21	38	38	16,400	2,280	1,320	190	1	390	42	31	2	1	1,000	100	100	4	0
5	53,789	2	135	55	18	32	37	18,200	3,250	1,300	260	2	580	190	95	7	2	1,000	1,000	10	0	0
6	54,833	2	120	45	18	37	38	16,500	2,600	1,550	270	6	490	210	43	1	5	1,000	100	100	6	0
7	47,831	2	110	38	18	32	39	11,000	4,900	1,300	230	2	190	180	15	2	3	100	100	10	6	0
8	47,125	2	130	34	16	26	39	18,000	2,850	1,300	200	1	180	95	7	3	2	1,000	10	100	6	0
9	46,609	2	170	31	18	29	39	73,000	3,700	1,260	80	2	80	65	75	3	1	1,000	100	10	6	0
10	40,847	2	180	29	14	22	39	36,000	1,950	1,400	350	4	800	41	70	2	2	1,000	100	10	4	0
11	45,989	2	230	30	16	24	39	29,000	3,100	1,200	270	0	220	105	25	1	1	1,000	10	0	2	0
12	55,458	2	170	38	18	28	37	37,000	6,500	1,800	180	0	380	43	29	2	2	1,000	100	10	2	0
13	53,126	2	175	45	16	21	38	42,000	3,700	1,250	155	2	420	39	9	1	1	100	100	10	2	0
14	46,365	2	130	38	17	18	36	13,000	5,900	1,150	315	4	160	24	5	2	1	100	100	10	4	0
15	46,983	2	120	29	15	20	38	11,000	7,300	1,350	220	2	150	32	16	0	1	100	10	1,000	2	0
16	46,312	2	120	27	15	23	36	15,000	4,650	1,900	320	3	750	210	95	3	2	1,000	100	100	2	0
17	45,539	2	80	28	14	25	33	3,000	800	850	160	1	140	18	12	2	0	100	100	0	0	0
18	46,142	2	110	27	18	27	35	6,000	1,050	680	120	0	160	70	9	3	0	1,000	10	0	0	0
19	54,008	2	120	27	21	34	35	3,000	3,600	1,300	120	0	390	350	49	3	0	100	100	10	4	0
20	46,581	2	660	36	15	39	33	150,000	7,400	1,700	280	3	150	26	2	0	0	10,000	100	10	4	0

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923–24—Continued

CINCINNATI (OHIO) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 cubic c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Feb., 1924	*1,000 gallons*	*° C.*																				
21	47,740	2	670	95	18	40	34	54,000	8,200	100	350	3	1,500	200	39	5	2	100	100	0	0	0
22	46,003	2	660	100	16	31	36	45,000	5,400	1,500	250	2	8,100	2,100	480	170	3	1,000	100	100	2	0
23	47,706	2	580	145	18	21	38	58,000	5,500	1,050	215	3	5,900	2,000	660	280	2	1,000	100	100	2	0
24	43,744	2	520	150	17	22	39	35,000	3,350	750	150	3	400	220	180	2	1	100	100	0	0	0
25	47,435	2	450	160	19	22	39	29,000	3,550	800	180	2	700	290	50	1	0	100	100	10	0	0
26	48,914	2	210	145	20	20	37	12,000	8,000	1,850	140	4	200	130	20	1	2	100	100	10	2	0
27	47,130	2	130	125	19	18	36	15,000	7,400	1,650	450	3	120	140	38	8	2	100	10	10	0	0
28	50,676	2	230	105	20	16	33	11,000	12,500	1,700	450	2	200	110	24	0	0	100	10	0	4	2
29	48,035	2	260	105	18	22	33	41,000	10,000	1,650	300	26	155	55	11	0	1	100	100	100	2	0
Mean	48,032	2	240	70	18	27	36	28,600	4,700	1,300	230	3	835	245	75	18	1	876	143	67	2.6	0.1
March, 1924																						
1	45,884	3	240	105	18	24	34	105,000	17,500	1,500	180	5	3,150	950	680	165	6	100	100	100	0	0
2	44,411	3	125	85	18	27	34	49,000	9,800	1,700	220	3	1,100	370	90	9	1	1,000	100	10	2	0
3	48,922	3	130	70	23	32	33	65,000	7,500	2,300	270	6	100	260	30	0	0	1,000	100	10	0	2
4	53,614	3	110	85	22	33	33	54,000	5,700	2,100	280	3	300	150	20	4	6	1,000	100	100	6	0
5	51,744	3	1,750	95	18	41	33	94,000	8,300	1,600	260	1	16,000	220	20	1	1	1,000	100	100	2	0
6	46,613	4	230	90	20	26	34	69,000	13,500	1,100	260	3	1,400	470	20	8	1	1,000	100	1,000	2	0
7	46,319	4	160	100	22	35	34	199,000	12,500	1,500	300	2	300	270	10	1	4	1,000	1,000	100	4	0
8	45,825	4	500	105	22	40	36	250,000	6,200	1,350	200	3	1,150	200	50	10	4	1,000	100	10	6	0
9	42,401	4	160	105	18	28	39	57,000	9,800	1,300	220	3	100	50	10	0	0	1,000	100	10	2	0
10	45,526	4	450	100	22	29	37	160,000	14,000	1,650	215	0	400	140	10	2	0	1,000	1,000	10	2	0
11	46,889	4	270	100	20	23	38	114,000	9,800	1,200	215	3	590	110	20	2	1	1,000	1,000	100	4	0
12	51,650	4	250	100	19	20	35	120,000	11,500	1,400	230	6	440	160	31	2	5	1,000	10,000	10	4	0
13	43,977	4	170	85	18	20	36	38,000	15,000	1,400	190	5	550	270	190	0	1	1,000	100	10	0	0
14	45,962	4	150	80	19	23	35	35,000	11,800	1,020	95	5	160	50	20	0	1	1,000	10,000	10	0	0
15	42,194	4	145	65	19	24	33	57,000	9,300	630	85	8	860	480	122	9	4	1,000	100	10	0	0
16	42,238	4	105	50	19	26	33	65,000	9,200	630	90	0	70	80	11	0	0	1,000	100	0	2	0
17	46,529	3	105	44	21	24	32	39,000	10,000	950	130	2	10	60	8	0	0	1,000	100	10	2	0
18	51,052	3	100	40	22	32	34	36,000	5,800	1,450	145	1	150	100	18	0	0	1,000	100	10	4	0

19	50,316	4	85	40	18	30	34	50,000	5,400	1,050	105	1	140	80	17	0	2	1,000	100	10	0	0
20	45,327	4	180	30	19	28	36	10,000	12,000	1,400	180	0	10	40	11	0	0	1,000	100	100	2	0
21	45,414	4	145	29	18	34	35	117,000	8,700	1,650	200	1	300	10	9	2	1	10,000	100	100	0	0
22	45,483	4	120	28	20	36	34	32,000	4,500	1,050	170	9	700	250	58	12	2	1,000	100	100	2	0
23	36,556	4	105	26	17	32	35	29,000	6,200	775	90	2	100	20	4	2	2	10,000	10	10	0	0
24	44,511	4	400	42	19	26	36	83,000	5,600	1,000	135	2	400	60	20	0	0	1,000	100	10	6	0
25	47,750	4	400	50	22	24	36	48,000	3,750	950	130	1	700	20	21	1	0	1,000	100	100	4	0
26	52,007	------	200	65	23	26	36	46,000	5,300	940	120	5	600	50	37	2	1	1,000	100	100	2	0
27	45,279	------	130	70	20	27	36	17,000	5,000	750	105	0	200	40	4	3	0	1,000	1,000	10	2	0
28	44,159	5	105	65	18	27	36	37,000	8,500	650	160	2	130	40	4	4	0	100	1,000	10	6	0
29	45,132	6	210	60	18	28	36	22,000	3,050	430	140	29	5,800	1,180	380	59	49	100,000	10,000	10	0	0
30	43,212	6	170	65	17	31	35	38,000	3,400	470	55	11	500	30	20	0	0	10,000	100	10	2	0
31	48,346	6	270	70	22	28	35	50,000	2,850	830	73	3	2,200	350	90	4	2	100,000	1,000	100	2	0
Mean	46,298	4	245	70	20	29	35	70,500	8,450	1,190	170	4	1,250	210	65	10	3	8,200	1,230	74	2.3	0.06
April, 1924																						
1	50,852	6	510	95	24	19	34	------	1,600	510	44	3	500	50	20	2	2	1,000	1,000	1,000	0	2
2	48,582	7	1,600	125	24	28	34	10,000	3,850	240	55	2	1,800	220	60	2	0	1,000	1,000	1,000	6	0
3	42,931	7	1,100	150	23	25	35	7,000	2,700	270	60	2	500	240	10	2	1	1,000	1,000	10	0	0
4	46,538	7	600	185	23	18	33	14,000	3,250	540	135	4	1,600	330	10	0	0	100	100	100	6	0
5	44,491	8	420	180	23	15	32	25,000	3,550	370	115	3	500	350	70	9	0	1,000	100	100	2	0
6	41,610	8	280	150	30	22	33	11,000	1,900	240	80	60	100	80	28	1	1	1,000	10	10	2	0
7	48,116	8	230	135	24	27	34	7,000	2,100	260	75	5	400	170	17	4	1	100	100	100	0	0
8	50,678	8	205	130	22	29	34	16,000	2,600	410	75	2	400	100	19	3	0	1,000	10	10	2	0
9	50,878	9	170	115	18	26	33	3,000	1,650	250	39	2	200	70	3	0	1	100	100	10	2	0
10	49,515	9	140	100	17	28	33	5,400	1,100	340	44	2	150	90	6	3	1	1,000	100	10	2	2
11	45,503	9	130	115	15	24	34	12,500	1,780	190	20	4	30	70	10	1	0	100	100	100	0	0
12	44,577	9	85	60	15	23	35	2,500	900	175	8	2	30	60	4	2	1	100	100	0	0	0
13	39,732	10	80	50	15	19	34	500	100	25	1	1	60	10	5	3	2	1,000	10	10	0	0
14	50,118	10	95	47	14	13	31	900	480	80	12	2	100	20	5	0	0	1,000	100	0	0	0
15	51,766	10	100	40	20	18	30	5,300	530	170	18	2	40	10	2	2	1	1,000	10	10	0	0
16	51,930	11	100	28	24	21	30	3,100	660	350	12	2	70	40	7	2	1	1,000	100	10	0	0
17	62,172	11	100	28	23	23	29	3,800	860	190	24	1	160	10	2	1	0	1,000	100	10	0	0
18	53,975	10	115	26	20	25	30	11,500	700	170	9	2	50	20	9	0	0	1,000	100	10	0	0
19	46,540	12	100	25	14	26	31	3,400	500	65	5	9	340	20	7	1	1	100	100	100	6	0
20	38,830	12	105	27	13	28	31	2,300	420	80	2	1	100	20	3	0	0	1,000	100	10	0	0
21	45,106	12	190	35	14	34	33	7,500	700	200	8	2	620	50	13	2	0	1,000	100	100	0	0
22	53,374	13	150	38	20	34	32	3,500	435	310	20	0	160	20	6	0	0	100	100	100	2	0
23	52,433	13	175	41	18	31	32	6,100	435	440	34	7	80	30	7	1	0	1,000	10	10	2	0
24	46,612	13	130	34	13	27	31	2,900	880	300	30	1	50	60	8	0	0	100	100	10	0	0
25	46,216	14	105	31	14	29	34	7,000	1,000	370	20	3	150	100	11	3	1	100	10	0	0	0
26	47,715	14	70	65	19	25	34	8,300	720	120	35	10	260	200	40	0	0	1,000	100	0	2	0
27	38,828	14	210	50	16	28	35	4,600	1,400	280	34	2	130	40	3	2	2	100	1,000	10	0	0
28	48,397	14	175	40	16	22	33	3,800	700	230	27	1	50	10	6	0	0	1,000	10	10	0	0
29	51,107	14	85	25	14	26	34	2,000	680	190	21	1	70	80	5	1	4	100	10	10	0	0
30	50,136	14	80	25	15	25	34	1,600	690	230	21	1	150	40	6	0	1	1,000	100	0	0	0
Mean	47,975	11	255	70	19	25	33	6,600	1,300	255	36	4	295	85	13	2	1	670	196	95	1.1	0.1

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923–24—Continued

CINCINNATI (OHIO) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
May, 1924	*1,000 gallons*	° *C.*																				
1	49, 618	14	150	29	15	27	33	8, 300	1, 050	420	70	3	60	60	1	1	0	100	100	10	2	0
2	44, 587	14	330	27	13	29	34	8, 100	1, 450	450	55	4	170	100	60	0	0	100	100	1, 000	2	0
3	49, 166	14	100	29	17	27	35	5, 600	900	400	33	1	560	30	11	0	0	1, 000	1, 000	100	2	0
4	42, 183	14	180	38	14	30	34	4, 600	850	100	60	6	140	10	8	0	0	1, 000	1, 000	10	4	0
5	47, 638	14	180	48	19	27	35	3, 500	780	280	16	3	80	50	6	0	0	10, 000	100	10	0	0
6	52, 361	15	180	55	20	29	35	7, 300	700	230	11	1	490	70	11	0	0	1, 000	100	10	2	0
7	52, 149	15	110	55	21	27	36	2, 800	700	85	15	0	70	30	8	1	0	10, 000	100	100	2	0
8	47, 751	15	105	45	21	23	36	3, 700	580	180	12	2	170	20	8	1	1	100	100	100	2	0
9	45, 157	15	115	38	17	27	33	2, 800	460	140	16	9	120	30	9	1	1	1, 000	100	100	2	4
10	42, 368	15	120	35	18	21	33	2, 200	300	85	9	1	720	260	66	9	1	100	1, 000	100	6	0
11	41, 818	15	90	29	15	24	33	1, 100	340	65	5	2	70	20	2	0	0	100	100	10	2	0
12	44, 422	15	95	28	16	25	33	2, 000	310	45	1	1	140	10	0	0	0	100	1, 000	10	0	0
13	51, 845	15	100	25	13	26	32	1, 500	240	70	3	1	270	30	13	0	0	10, 000	10	10	0	2
14	58, 369	15	105	25	14	22	33	1, 400	270	20	2	1	340	10	3	0	0	1, 000	100	100	2	0
15	45, 695	15	200	28	16	18	32	4, 400	420	25	0	0	100	20	3	0	1	10, 000	100	100	0	0
16	42, 129	14	320	36	13	17	32	48, 000	750	90	2	0	100	20	4	0	0	1, 000	100	10	4	0
17	46, 193	14	210	40	16	15	31	19, 000	1, 850	220	9	1	1, 400	240	48	1	1	100	1, 000	10	0	0
18	41, 693	14	230	48	17	15	31	4, 000	650	110	4	1	100	80	8	0	0	100	100	10	4	0
19	48, 484	14	200	52	18	14	29	12, 000	700	115	8	1	200	10	10	1	1	10, 000	1, 000	100	6	0
20	50, 859	14	140	55	17	19	28	2, 000	1, 000	170	10	4	200	130	17	0	0	10, 000	100	10	4	0
21	46, 152	14	120	50	18	22	29	6, 000	1, 400	160	11	1	700	100	27	1	1	1, 000	100	100	8	0
22	45, 699	14	105	41	18	25	31	3, 900	950	150	8	1	70	40	5	0	0	1, 000	100	100	4	0
23	45, 555	14	100	35	15	24	33	6, 100	900	170	6	1	90	30	4	0	0	10, 000	1, 000	10	4	0
24	48, 635	15	110	40	14	21	32	8, 400	850	90	4	1	1, 420	100	36	3	3	10, 000	100	100	2	0
25	41, 669	15	130	40	13	24	30	1, 800	750	90	1	1	120	10	1	0	0	100	100	100	4	0
26	44, 455	15	120	38	13	20	29	1, 200	420	60	2	1	50	10	5	0	0	1, 000	100	10	8	0
27	50, 614	15	130	28	16	22	30	1, 600	370	110	3	2	40	10	4	0	0	1, 000	1, 000	10	6	0
28	51, 428	16	110	26	13	23	31	1, 300	280	60	4	1	30	20	4	1	1	1, 000	100	10	0	0
29	41, 554	15	160	25	12	24	31	8, 000	210	25	2	1	100	10	1	0	0	1, 000	1, 000	100	0	0
30	43, 089	15	105	23	12	23	31	1, 600	210	25	2	1	80	40	3	1	1	1, 000	100	100	2	0
31	42, 789	15	120	24	8	24	34	900	200	10	1	1	130	30	2	0	0	1, 000	1, 000	100	0	0
Mean	46, 649	14	150	37	16	23	32	6, 000	670	135	12	2	270	55	13	0. 7	0. 4	3, 060	387	85	2. 7	0. 2

June, 1924																					
1	39,231	15	140	21	8	28	33	2,000	140	35	1	0	30	10	1	1	0	1,000	100	100	0	0
2	46,427	16	380	55	16	25	34	4,800	400	65	0	0	270	80	7	0	0	1,000	1,000	100	0	0
3	50,106	16	390	70	17	24	34	4,300	400	40	2	2	220	100	14	0	0	1,000	1,000	100	6	0
4	49,738	16	210	60	18	24	33	2,200	550	70	1	0	90	30	6	0	1	100	100	100	8	0
5	46,725	17	145	60	17	25	32	900	580	160	3	2	80	20	9	0	0	1,000	100	100	10	0
6	44,348	18	170	55	20	30	32	5,200	600	120	5	1	330	60	35	1	1	10,000	1,000	10	4	0
7	44,657	18	110	30	15	29	36	4,100	680	200	6	1	340	610	39	3	2	1,000	1,000	100	6	0
8	44,109	18	145	40	15	30	35	5,300	380	120	7	2	260	20	0	1	0	1,000	100	10	0	0
9	47,698	20	160	34	13	21	37	2,300	360	95	12	1	130	10	12	12	0	10,000	1,000	100	2	0
10	51,535	20	400	65	15	49	40	6,306	900	140	3	1	920	340	35	2	0	1,000	1,000	100	2	0
11	53,094	21	500	75	14	45	43	4,800	2,000	240	3	2	560	150	10	1	2	1,000	100	100	4	0
12	47,981	21	2,100	150	19	50	43	130,000	4,300	310	7	2	4,200	490	40	4	1	10,000	1,000	100	10	0
13	53,094	21	600	160	20	38	45	36,000	3,200	200	13	55	1,600	370	10	1	1	10,000	1,000	100	4	0
14	51,987	21	900	170	21	35	44	41,000	2,500	180	8	170	1,300	750	70	5	......	10,000	1,000	100	10	0
15	47,613	21	450	160	25	35	44	11,000	1,550	200	3	33	1,100	240	80	3	0	1,000	1,000	1,000	8	0
16	47,960	21	330	135	25	36	44	9,000	2,100	140	4	68	300	150	40	1	3	1,000	10,000	1,000	10	0
17	54,368	21	220	125	23	39	44	7,000	1,700	110	1	110	600	260	50	2	3	1,000	1,000	100	6	0
18	58,563	22	300	110	20	36	45	11,000	1,400	210	4	75	1,000	220	40	1	5	1,000	10,000	100	4	0
19	53,422	23	270	100	19	39	44	9,000	850	145	6	32	400	70	25	2	2	10,000	1,000	10	4	0
20	56,808	24	290	95	22	43	43	12,000	850	140	3	26	600	270	190	2	0	1,000	1,000	100	6	0
21	50,021	24	230	85	19	41	46	3,000	1,100	120	1	24	1,300	1,100	175	1	19	100	1,000	100	6	0
22	44,296	25	270	60	16	44	49	12,000	450	65	1	7	200	20	10	0	0	1,000	100	100	0	0
23	52,805	25	900	85	16	43	49	3,000	1,700	240	3	250	1,200	120	20	0	0	10,000	100	10	2	0
24	58,453	26	160	80	17	49	49	2,000	1,700	220	3	5	1,900	600	90	4	1	1,000	1,000	1,000	2	0
25	53,812	26	120	60	16	53	51	2,000	650	65	2	325	600	180	60	1	5	1,000	1,000	10	8	0
26	51,914	26	135	50	14	59	55	2,900	900	75	3	35	1,030	140	43	2	2	1,000	100	100	4	0
27	52,743	26	400	45	15	57	56	18,000	700	70	6	8	3,000	310	23	1	2	1,000	100	100	0	2
28	51,131	26	170	45	13	57	57	1,800	450	70	5	8	1,850	400	66	58	31	1,000	1,000	100	6	0
29	49,263	26	260	55	13	56	59	18,000	1,150	60	2	8	1,900	250	30	0	4	10,000	100	100	2	0
30	50,947	26	400	90	15	56	58	11,000	850	130	4	5	3,000	280	40	5	2	1,000	1,000	10	0	0
Mean	50,461	21	375	80	17	40	44	12,700	1,170	135	4	41	1,010	255	42	3.8	2.9	3,340	1,300	172	4.5	0.07

LOUISVILLE (KY.) WATER FILTRATION PLANT

Sept., 1923																					
1	36,748	24	290	195	55	67	43	2,800	1,500	250	34	9	600	......	......	......	12	1,000	100	100	10	0
2	35,125	24	330	235	60	69	45	2,700	1,700	275	55	17	1,300	......	......	......	8	100	100	10	10	0
3	33,730	24	270	215	85	69	46	2,800	1,500	300	100	26	1,100	......	......	......	11	100	100	10	10	0
4	34,818	24	200	195	65	72	48	2,300	2,700	140	36	16	800	......	......	......	14	1,000	100	0	100	0
5	36,474	24	215	190	60	72	51	12,500	1,900	160	34	30	4,000	......	......	......	16	100	100	100	10	0
6	36,645	25	130	175	60	71	53	2,800	1,800	350	44	24	2,000	......	......	......	23	1,000	1,000	100	100	0
7	35,883	24	115	150	60	67	53	1,400	1,500	300	200	14	800	......	......	......	19	100	1,000	100	1,000	2
8	34,291	24	150	120	60	64	56	1,600	2,300	130	120	16	700	......	......	......	30	100	1,000	1,000	100	2
9	29,251	23	165	110	25	70	53	4,600	3,600	120	80	13	3,200	......	......	......	50	100	100	10	10	0
10	35,369	22	160	105	45	74	56	3,800	2,600	190	475	15	1,400	......	......	......	33	1,000	100	100	100	0
11	36,759	22	100	100	35	65	58	1,900	2,100	90	40	11	1,600	......	......	......	34	100	1,000	10	100	0

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923–24—Continued

LOUISVILLE (KY.) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					E. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Sept., 1923	*1,000 gallons*	° *C.*																				
12	35, 201	22	85	95	35	69	61	3, 300	3, 500	275	1, 400	7	500	------	------	------	28	1, 000	100	100	1, 000	0
13	33, 649	21	80	85	38	59	61	2, 800	1, 700	550	75	14	1, 000	------	------	------	60	1, 000	1, 000	100	1, 000	0
14	35, 450	20	75	75	32	60	59	2, 600	2, 100	350	36	48	1, 400	------	------	------	75	100	100	100	10	0
15	33, 808	20	65	70	27	61	57	2, 700	1, 200	300	100	12	1, 000	------	------	------	11	1, 000	100	10	0	0
16	31, 617	20	65	70	30	62	54	2, 700	1, 300	230	60	32	1, 000	------	------	------	18	100	1, 000	10	100	2
17	35, 931	20	60	65	25	61	56	1, 400	1, 800	230	90	19	700	------	------	------	12	100	100	100	10	0
18	35, 983	21	55	60	25	61	58	700	500	250	240	26	950	------	------	------	5	1, 000	100	100	100	0
19	34, 892	22	35	45	33	58	55	1, 000	1, 200	350	80	5	1, 000	------	------	------	5	100	100	100	10	0
20	35, 143	22	30	30	27	58	56	500	425	1, 100	50	15	1, 200	------	------	------	10	100	100	0	10	0
21	33, 531	21	15	25	20	56	56	550	170	300	70	7	600	------	------	------	11	1, 000	100	0	10	0
22	39, 947	21	20	25	15	56	53	1, 100	180	180	55	5	600	------	------	------	1	10	10	100	0	0
23	37, 012	21	20	20	15	57	53	550	2, 000	1, 000	700	5	1, 100	------	------	------	5	10	10	0	0	0
24	38, 269	21	15	15	16	57	53	600	24, 500	73, 500	30, 000	240	600	------	------	------	300	10	10	10	0	0
25	41, 143	22	19	12	17	56	52	350	3, 000	6, 000	10, 000	36	900	------	------	------	250	10	10	10	10	0
26	45, 713	21	20	15	15	64	54	425	23, 000	13, 000	28, 000	12	650	------	------	------	18	10	10	0	0	0
27	44, 444	23	25	20	16	71	54	400	1, 800	700	2, 800	16	1, 000	------	------	------	0	100	10	10	0	0
28	40, 889	24	25	18	15	73	59	220	700	600	1, 700	10	600	------	------	------	0	10	10	0	10	0
29	44, 892	23	20	18	------	69	------	8, 400	600	------	1, 300	9	1, 500	------	------	------	4	0	100	------	0	0
30	34, 777	23	20	15	------	65	------	800	3, 200	------	2, 000	20	1, 100	------	------	------	48	100	10	------	0	0
Mean	36, 699	22	95	85	36	64	54	2, 343	3, 202	3, 611	5, 670	24	1, 163	------	------	------	37	349	256	82	127	0. 2
Oct., 1923									(7)													
1	39, 729	22	15	15	------	60	------	1, 300	5, 400	------	1, 500	17	1, 400	------	------	------	24	100	0	------	0	0
2	39, 805	21	17	15	------	61	------	500	5, 800	------	2, 500	10	550	------	------	------	12	10	0	------	0	0
3	40, 156	21	23	13	------	62	------	1, 200	3, 400	------	2, 000	14	850	------	------	------	210	10	0	------	0	0
4	38, 379	21	25	12	------	60	------	1, 000	3, 100	------	2, 100	14	800	------	------	------	12	100	0	------	0	0
5	37, 419	20	25	14	------	60	------	550	1, 100	------	750	6	250	------	------	------	10	100	0	------	0	0
6	36, 595	19	25	15	------	59	------	475	1, 300	------	650	13	230	------	------	------	4	10	0	------	10	0
7	30, 353	19	25	13	------	58	------	700	1, 600	------	450	10	650	------	------	------	17	10	10	------	0	0
8	35, 935	17	26	14	------	60	------	600	1, 100	------	350	10	700	------	------	------	42	10	0	------	0	0
9	37, 725	17	26	15	------	63	------	3, 700	1, 000	------	180	8	2, 000	------	------	------	16	10	10	------	0	0
10	38, 053	17	25	15	------	63	------	700	600	------	160	10	950	------	------	------	90	100	0	------	0	0

11	37,623	17	24	15	------	63	------	475	300	------	120	13	375	------	------	------	13	1,000	10	------	10	0
12	37,722	17	23	15	------	64	------	225	500	------	650	17	250	------	------	------	22	100	10	------	10	0
13	38,032	17	20	16	------	65	------	550	500	------	600	23	200	------	------	------	24	10	10	------	0	0
14	33,758	17	20	15	------	65	------	450	300	------	180	12	375	------	------	------	10	10	0	------	10	0
15	38,814	18	20	16	------	65	------	250	600	------	60	10	350	------	------	------	17	10	10	------	0	0
16	43,455	18	19	15	------	64	------	1,200	375	------	120	16	1,100	------	------	------	11	0	10	------	0	0
17	35,728	18	15	13	------	63	------	1,300	300	------	300	10	1,500	------	------	------	12	10	0	------	0	0
18	37,217	18	12	12	------	63	------	1,100	8,500	------	2,700	10	900	------	------	------	85	10	0	------	0	0
19	37,385	18	12	13	------	63	------	1,200	52,000	------	35,000	12	950	------	------	------	12	0	0	------	0	0
20	36,111	16	12	13	------	62	------	950	56,000	------	11,500	7	1,400	------	------	------	100	10	10	------	0	0
21	31,914	16	12	12	------	62	------	400	23,500	------	29,500	10	250	------	------	------	11	10	10	------	0	0
22	35,623	15	10	10	------	66	------	750	16,000	------	1,600	10	700	------	------	------	8	0	0	------	0	0
23	37,482	15	15	9	------	71	------	350	3,900	------	1,600	5	800	------	------	------	13	0	10	------	0	0
24	37,609	15	10	8	------	72	------	550	6,000	------	1,400	7	325	------	------	------	4	10	0	------	0	0
25	38,637	16	10	10	------	74	------	475	1,700	------	600	1	500	------	------	------	7	10	0	------	0	0
26	37,210	14	10	10	------	77	------	10,000	2,000	------	2,200	4	2,300	------	------	------	1	100	0	------	0	0
27	36,653	15	11	11	------	78	------	850	20,000	------	3,800	10	1,000	------	------	------	2	1,000	0	------	0	0
28	31,848	15	9	10	------	79	------	1,200	26,000	------	6,800	85	500	------	------	------	32	10	0	------	0	0
29	38,611	15	9	10	------	81	------	550	47,500	------	5,600	15	100	------	------	------	13	10	10	------	0	0
30	38,001	16	10	11	------	82	------	220	30,000	------	3,400	10	325	------	------	------	4	0	0	------	10	0
31	37,653	13	12	12	------	84	------	300	19,000	------	3,300	20	230	------	------	------	11	10	0	------	0	0
Mean	37,101	17	17	13	------	67	------	1,100	10,950	------	3,925	13	735	------	------	------	27	90	3.5	------	1.6	0
Nov., 1923																						
1	37,494	12	12	11	------	86	------	(8)	10,000	------	1,200	4	250	------	------	------	6	10	0	------	0	0
2	42,100	12	10	10	------	88	------	160	3,200	------	1,500	9	80	------	------	------	8	10	10	------	0	0
3	35,405	12	12	10	------	90	------	50	3,800	------	1,100	6	100	------	------	------	8	10	0	------	0	0
4	34,860	13	12	10	------	89	------	210	8,000	------	1,600	11	240	------	------	------	9	10	0	------	0	0
5	36,822	14	12	10	------	90	------	1,100	37,000	------	5,800	325	250	------	------	------	43	10	0	------	10	0
6	37,355	14	10	9	------	80	------	230	56,000	------	15,500	48	35	------	------	------	10	100	0	------	10	0
7	37,574	11	9	8	------	90	------	1,000	38,000	------	15,500	70	120	------	------	------	8	100	0	------	10	0
8	39,668	11	9	8	------	91	------	750	33,500	------	11,600	220	375	------	------	------	24	10	0	------	0	0
9	37,867	9	9	7	------	91	------	1,100	27,000	------	9,000	70	275	------	------	------	3	100	100	------	10	2
10	35,880	9	16	8	------	88	------	950	19,000	------	4,400	21	250	------	------	------	(8)	100	10	------	0	2
11	32,798	10	23	8	------	78	------	4,800	8,300	------	4,100	6	800	------	------	------	4	1,000	10	------	0	0
12	37,241	11	70	11	------	65	------	13,000	4,800	------	1,800	10	3,600	------	------	------	8	100	100	------	10	0
13	42,566	10	90	17	------	56	------	30,000	4,500	------	1,150	17	2,300	------	------	------	5	10	1,000	------	100	0
14	40,425	10	80	20	------	54	------	15,500	7,600	------	800	4	3,000	------	------	------	3	100	1,000	------	10	0
15	37,240	11	75	19	------	55	------	13,000	9,800	------	500	7	1,600	------	------	------	4	1,000	10,000	------	10	0
16	35,849	12	65	17	------	54	------	4,800	2,500	------	240	15	1,300	------	------	------	0	100	0	------	10	0
17	35,995	10	50	16	------	57	------	6,000	1,800	------	200	5	2,400	------	------	------	2	1,000	100	------	0	0
18	31,723	10	35	13	------	59	------	3,000	1,400	------	300	5	600	------	------	------	1	10	100	------	100	0
19	35,748	10	26	12	------	60	------	4,200	600	------	300	4	1,800	------	------	------	1	10	10	------	10	0
20	36,155	9	20	9	------	63	------	3,400	1,200	------	230	3	1,200	------	------	------	0	100	10	------	10	0
21	36,523	11	16	7	------	66	------	3,100	850	------	450	2	850	------	------	------	1	10	10	------	100	0
22	36,261	9	12	7	------	65	------	2,500	900	------	300	4	1,600	------	------	------	8	10	10	------	0	0
23	36,883	10	12	9	------	65	------	3,500	700	------	800	10	800	------	------	------	5	100	10	------	0	0
24	36,748	9	15	10	------	64	------	3,000	450	------	300	10	1,600	------	------	------	12	100	10	------	10	0
25	31,342	9	12	10	------	65	------	2,200	400	------	650	8	325	------	------	------	12	10	10	------	0	0

[7] Copper sulphate applied Oct. 1, 4, 9, 16, 25. No alum used during this month.

[8] Contaminated.

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923–24—Continued

LOUISVILLE (KY.) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Nov., 1923	*1,000 gallons*	*° C.*																				
26	37,241	11	12	8	------	64	------	3,500	400	------	550	20	450	------	------	------	12	100	10	------	0	0
27	37,343	8	11	8	------	63	------	1,500	650	------	550	12	1,200	------	------	------	12	10	100	------	10	4
28	36,268	8	20	10	------	61	------	9,500	3,000	------	850	30	750	------	------	------	8	100	100	------	10	0
29	31,579	9	80	16	10	53	------	28,000	5,400	------	1,300	30	1,000	------	------	------	16	1,000	10	------	10	0
30	36,376	8	90	45	25	46	60	27,000	17,000	3,800	1,500	22	1,600	------	------	------	8	100	100	------	10	0
Mean	36,578	10	30	12	------	70	------	6,443	10,258	------	2,800	33	1,025	------	------	------	8	181	427	------	15	0.3
Dec., 1923																						
1	30,971	7	100	60	25	47	53	14,500	9,000	3,500	280	6	750	------	------	------	5	10,000	100	100	6	0
2	31,623	7	100	75	23	49	50	12,000	12,000	3,500	700	10	1,500	------	------	------	3	1,000	1,000	100	6	2
3	32,769	9	95	85	16	47	47	10,000	6,700	2,200	350	8	1,300	------	------	------	4	100	100	10	4	0
4	35,730	9	100	85	17	48	44	8,000	3,100	6,800	150	2	700	------	------	------	0	100	100	100	4	0
5	37,173	9	105	90	17	46	43	14,000	9,000	3,200	200	1	950	------	------	------	3	100	100	10	6	0
6	36,188	9	110	90	16	39	42	15,000	12,000	2,400	280	8	750	------	------	------	5	100	100	100	8	0
7	35,021	8	245	95	18	43	41	47,000	15,000	1,500	500	4	2,300	------	------	------	2	1,000	1,000	100	6	0
8	33,925	11	545	130	18	52	39	36,000	24,000	1,500	500	4	4,700	------	------	------	3	10,000	1,000	10	6	0
9	27,283	13	925	220	22	53	38	40,000	14,000	1,300	220	6	5,500	------	------	------	0	10,000	1,000	10	8	0
10	36,925	11	925	255	30	50	40	24,000	10,000	2,400	450	4	2,200	------	------	------	2	1,000	100	100	8	0
11	34,728	9	700	360	27	48	37	18,000	13,500	1,300	850	28	3,500	------	------	------	2	1,000	10,000	100	6	0
12	34,010	9	625	285	28	46	36	15,500	9,600	1,100	160	5	2,500	------	------	------	2	1,000	1,000	0	2	0
13	33,174	11	500	260	25	50	34	12,500	7,000	1,100	600	14	4,500	------	------	------	7	1,000	100	10	2	0
14	34,252	7	450	255	30	50	34	19,000	10,000	800	200	7	2,300	------	------	------	4	1,000	100	10	8	0
15	34,057	8	600	260	27	56	34	32,500	10,500	800	160	8	3,500	------	------	------	5	1,000	100	10	4	0
16	32,486	8	510	270	33	54	36	23,500	11,000	800	170	6	2,000	------	------	------	3	1,000	1,000	100	6	0
17	32,542	7	400	265	35	51	37	20,000	8,400	1,400	300	8	2,500	------	------	------	3	1,000	1,000	10	8	0
18	35,175	8	300	230	32	46	36	14,500	6,600	600	120	9	1,200	------	------	------	9	1,000	1,000	100	4	0
19	35,916	9	230	180	28	45	34	16,500	12,000	1,000	120	8	900	------	------	------	2	1,000	10,000	10	2	0
20	34,904	10	235	165	30	47	34	19,500	9,600	1,300	210	4	900	------	------	------	2	1,000	1,000	100	2	0
21	33,961	10	265	170	27	52	34	20,000	11,500	1,000	190	15	1,600	------	------	------	3	1,000	1,000	10	2	0
22	32,266	13	450	190	35	65	38	17,000	11,000	1,400	250	10	2,900	------	------	------	8	1,000	1,000	10	8	0

23	31,409	11	550	275	45	72	39	25,500	12,000	1,300	650	14	2,800	------	------	------	10	1,000	1,000	100	10	0
24	30,657	10	775	340	65	79	43	41,000	13,000	1,400	650	33	8,100	------	------	------	12	10,000	1,000	100	10	0
25	30,156	9	800	430	75	79	48	24,000	15,000	1,200	600	16	2,900	------	------	------	7	10,000	1,000	10	10	0
26	32,262	10	700	410	55	72	48	29,000	15,000	1,200	750	25	3,700	------	------	------	13	10,000	1,000	1,000	10	0
27	38,144	10	510	340	35	57	50	17,000	11,500	750	210	12	2,900	------	------	------	9	10,000	10,000	10	6	0
28	39,020	10	460	315	50	52	46	17,000	14,000	1,600	100	8	2,300	------	------	------	6	1,000	1,000	100	4	0
29	32,778	10	500	300	30	52	42	19,500	10,000	750	400	6	1,400	------	------	------	5	1,000	1,000	100	2	0
30	30,688	11	375	260	20	53	37	26,500	12,500	600	210	11	1,600	------	------	------	2	1,000	100	100	4	0
31	32,533	11	300	220	30	47	35	23,000	12,500	600	120	4	1,800	------	------	------	2	1,000	100	10	4	0
Mean	33,660	10	440	225	31	53	40	21,660	11,323	1,622	343	10	2,466	------	------	------	5	2,920	1,550	85	5.7	0.06
Jan., 1924																						
1	38,844	7	440	230	32	40	30	22,000	7,300	1,300	375	1	1,900	------	------	------	1	10,000	10,000	10	6	0
2	36,573	7	660	325	32	53	31	35,000	14,000	1,600	140	0	3,400	------	------	------	0	1,000	1,000	10	2	0
3	39,230	8	675	400	50	48	32	27,500	13,500	1,400	300	0	4,800	------	------	------	1	10,000	10,000	100	0	0
4	39,462	7	700	450	45	44	31	24,000	19,000	1,200	190	5	1,600	------	------	------	0	1,000	10,000	10	2	0
5	40,480	4	675	475	65	33	28	34,500	21,000	1,400	950	2	3,600	------	------	------	2	10,000	1,000	100	8	0
6	51,071	3	565	450	50	32	24	24,000	21,500	2,200	1,100	13	2,200	------	------	------	9	1,000	1,000	100	8	0
7	53,233	4	450	450	50	32	18	23,000	17,000	1,400	110	7	1,500	------	------	------	5	10,000	1,000	100	0	0
8	45,641	5	375	390	50	29	13	18,000	15,000	1,200	180	3	1,300	------	------	------	0	1,000	10,000	100	2	0
9	39,898	4	315	315	55	27	10	16,000	13,000	1,400	160	2	800	------	------	------	2	1,000	1,000	100	0	0
10	40,526	6	260	260	40	24	11	15,500	13,000	1,300	80	3	900	------	------	------	2	1,000	1,000	10	4	0
11	42,245	6	325	230	37	34	10	24,000	19,500	2,300	100	7	1,600	------	------	------	1	10,000	1,000	10	0	0
12	41,852	5	460	250	45	44	13	27,500	19,500	1,800	275	8	2,800	------	------	------	2	1,000	100	100	2	0
13	38,212	3	725	440	70	60	23	31,000	19,000	700	700	6	3,200	------	------	------	8	10,000	1,000	0	4	0
14	44,082	4	530	460	75	58	28	35,500	17,000	2,100	2,000	27	1,600	------	------	------	11	10,000	1,000	100	10	0
15	45,395	4	540	430	70	53	33	28,500	23,500	1,600	1,500	33	3,800	------	------	------	10	1,000	1,000	100	8	0
16	40,294	5	560	450	75	44	34	31,000	21,000	2,600	1,100	37	1,100	------	------	------	12	1,000	1,000	1.000	10	0
17	44,548	4	510	425	65	40	31	22,500	17,000	2,000	1,800	29	1,600	------	------	------	10	10,000	1,000	100	10	0
18	44,323	4	535	425	70	49	29	56.000	40,000	4,000	1,500	25	1,900	------	------	------	11	1,000	10,000	100	6	0
19	39,480	5	440	420	60	44	30	29,000	19,000	4,700	2,800	28	1,600	------	------	------	6	1,000	1,000	100	8	0
20	41,629	5	400	360	45	40	30	75,000	50,000	5,000	2.300	26	1,000	------	------	------	4	1,000	1,000	100	8	0
21	52,268	3	400	335	45	37	26	31,000	46,000	2,300	1,400	12	1,750	------	------	------	7	1,000	100	100	8	0
22	54,362	1	535	380	50	34	23	26,000	30,000	1,800	1,000	10	1,300	------	------	------	2	1,000	1,000	100	0	0
23	46,516	5	475	400	60	40	21	15,000	12,000	1,500	230	10	1,500	------	------	------	1	10,000	1,000	100	8	0
24	41,246	4	335	325	55	35	20	15,000	12,000	1,400	850	14	1,600	------	------	------	8	1,000	1,000	10	2	0
25	40,805	5	285	245	40	34	20	13,000	15,000	2,300	400	15	900	------	------	------	6	1,000	100	10	4	0
26	48,719	1	260	215	35	37	21	25,000	11,500	2,400	1,200	8	1,200	------	------	------	2	1,000	100	10	6	0
27	47,424	1	210	185	45	47	24	27,000	18,000	3,300	400	5	1,100	------	------	------	4	1,000	1,000	10	4	0
28	46,159	2	170	150	40	50	27	14,500	11,500	2,800	375	19	1,400	------	------	------	8	1,000	100	10	2	0
29	43,192	4	125	120	35	50	32	7,400	8,600	2,200	275	14	1,200	------	------	------	10	1,000	1,000	100	2	0
30	39,497	4	110	100	30	53	36	9,800	12,500	2,500	650	15	1,400	------	------	------	10	100	100	10	4	0
31	42,129	4	100	95	30	58	41	16,000	11,000	1,800	500	14	600	------	------	------	9	100	100	10	6	0
Mean	43,422	4	425	330	50	42	25	25,780	19,000	2,100	805	13	1,810	------	------	------	5	3,560	2,250	91	4.6	0

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923–24—Continued

LOUISVILLE (KY.) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Feb., 1924	*1,000 gallons*	*° C.*																				
1	38,612	5	120	95	27	57	42	7,500	9,000	4,500	750	11	550	------	------	------	3	100	100	10	10	0
2	39,460	4	235	110	25	72	47	21,000	16,000	1,800	700	14	3,400	------	------	------	3	1,000	1,000	100	6	0
3	33,562	6	220	140	29	71	53	19,500	20,000	2,300	800	8	1,800	------	------	------	3	1,000	10,000	100	4	0
4	38,478	7	165	135	29	70	55	17,500	8,000	1,800	900	15	1,900	------	------	------	2	1,000	10,000	10	8	0
5	40,779	6	160	130	30	66	58	30,000	13,000	5,000	1,900	50	2,800	------	------	------	7	100	100	100	10	0
6	45,111	4	325	150	37	68	61	29,000	17,500	1,900	1,200	13	800	------	------	------	6	100	100	100	10	0
7	47,670	3	205	145	30	68	61	21,500	17,000	2,200	700	46	1,200	------	------	------	4	1,000	100	10	8	0
8	44,420	4	340	230	25	79	60	30,000	35,000	2,400	850	21	1,600	------	------	------	4	1,000	100	100	10	0
9	40,730	6	185	215	57	72	63	31,000	17,500	2,700	1,100	50	1,700	------	------	------	5	1,000	1,000	100	10	0
10	34,593	4	135	155	37	60	63	17,500	16,000	2,200	1,200	14	1,700	------	------	------	5	1,000	1,000	100	10	0
11	39,867	5	120	120	25	54	60	16,000	24,500	2,600	1,200	47	1,300	------	------	------	5	1,000	100	10	10	0
12	39,752	4	120	105	20	48	59	45,000	24,000	2,200	900	28	1,500	------	------	------	4	1,000	100	10	8	0
13	39,144	4	140	95	20	46	49	56,000	28,000	3,000	1,000	16	1,600	------	------	------	1	100	100	100	10	0
14	38,824	4	150	110	23	46	46	29,000	62,000	2,300	800	5	1,200	------	------	------	5	100	1,000	10	6	0
15	37,759	5	110	100	22	49	43	44,000	35,000	6,000	950	7	800	------	------	------	2	100	100	10	0	0
16	37,799	4	100	85	22	48	43	34,000	14,000	3,900	1,300	8	700	------	------	------	3	100	100	10	10	0
17	33,116	5	75	80	20	52	42	15,000	25,500	4,100	1,800	13	160	------	------	------	3	10	100	100	4	0
18	39,370	4	85	65	18	51	42	28,000	23,500	5,700	2,800	2	1,200	------	------	------	0	100	100	10	10	0
19	38,462	6	75	70	18	57	45	26,000	27,000	4,000	1,600	32	1,200	------	------	------	1	100	100	10	10	0
20	40,019	5	95	65	16	56	47	30,000	15,000	3,400	1,200	10	1,200	------	------	------	3	10,000	1,000	10	6	0
21	42,571	4	390	135	22	74	49	26,000	16,000	3,600	1,000	6	1,300	------	------	------	3	1,000	1,000	10	10	0
22	42,033	3	735	260	30	77	52	29,000	23,000	1,600	1,400	8	2,600	------	------	------	0	1,000	100	100	8	0
23	34,361	6	775	400	60	61	45	30,000	22,000	2,700	1,200	14	2,800	------	------	------	2	1,000	100	10	10	0
24	31,896	5	610	410	55	45	51	25,500	20,000	2,700	1,700	12	800	------	------	------	6	100,000	1,000	10	10	0
25	37,544	5	540	400	53	34	46	24,000	21,000	2,300	700	18	1,700	------	------	------	2	10,000	100	10	8	0
26	39,269	5	485	375	45	35	36	33,000	21,000	1,600	1,400	16	1,200	------	------	------	7	1,000	100	10	8	0
27	38,838	6	390	335	35	34	28	22,000	16,500	1,600	1,000	4	1,900	------	------	------	3	1,000	1,000	10	8	0
28	37,818	6	250	265	40	38	24	25,000	13,500	1,300	550	5	1,000	------	------	------	2	100	1.000	100	8	0
29	37,425	4	155	180	35	41	25	35,000	13,000	2,600	400	12	800	------	------	------	2	100	100	10	10	0
Mean	38,942	5	258	177	32	56	48	27,483	21,052	2,900	1,138	17	1,462	------	------	------	3	4,660	1,060	44	8.3	0

Mar., 1924																					
1	36,049	6	150	130	30	39	27	31,500	12,500	2,500	1,300	10	600	------	------	------	4	1,000	100	10	8	0
2	28,662	3	125	110	22	46	29	14,000	13,000	1,600	600	10	700	------	------	------	8	100	100	10	2	0
3	36,028	5	120	105	21	49	30	14,000	6,000	1,500	220	10	700	------	------	------	8	100	100	10	4	0
4	37,265	6	105	85	18	52	33	14,500	7,600	1,300	600	6	700	------	------	------	4	100	100	10	8	0
5	37,468	7	130	90	16	56	36	14,000	6,000	1,900	300	5	600	------	------	------	0	100	1,000	10	2	0
6	36,878	6	1,000	140	33	64	41	22,500	6,300	2,000	130	5	1,100	------	------	------	1	1,000	1,000	10	6	0
7	36,612	6	1,825	545	60	82	44	50,000	13,500	2,000	400	7	4,300	------	------	------	2	1,000	1,000	100	6	0
8	36,746	6	790	750	75	70	46	25,000	21,000	2,300	650	2	1,900	------	------	------	3	1,000	1,000	100	8	0
9	32,887	5	360	475	50	56	46	23,500	18,000	2,800	1,100	9	2,300	------	------	------	3	1,000	1,000	10	10	0
10	35,756	6	650	410	38	59	45	18,000	------	2,300	400	38	1,300	------	------	------	2	1,000	1,000	100	10	0
11	41,759	4	400	365	62	42	42	30,000	23,500	2,800	1,100	4	2,000	------	------	------	1	1,000	1,000	10	6	0
12	36,456	4	400	260	50	41	39	38,000	14,500	1,600	500	14	1,600	------	------	------	3	100	1,000	10	10	0
13	38,300	4	345	260	35	41	37	15,000	14,500	1,400	350	3	750	------	------	------	6	1,000	1,000	100	6	0
14	37,555	5	240	200	35	42	36	30,000	13,000	2,400	800	12	400	------	------	------	4	1,000	1,000	10	10	0
15	37,021	4	205	165	26	62	35	21,000	15,000	1,400	325	10	1,200	------	------	------	6	10,000	100	10	2	0
16	32,625	3	175	130	24	44	35	15,000	13,500	2,700	650	8	550	------	------	------	1	1,000	1,000	10	2	0
17	36,117	3	120	115	23	44	35	15,500	8,400	1,800	800	8	1,100	------	------	------	7	10,000	10,000	100	8	0
18	38,004	5	100	95	20	46	37	10,500	8,700	2,000	550	3	750	------	------	------	0	100	100	100	8	0
19	36,068	5	90	85	22	49	39	7,600	5,200	1,700	180	8	850	------	------	------	3	1,000	100	10	6	0
20	37,380	5	105	80	24	60	40	25,000	7,600	2,100	325	1	800	------	------	------	0	1,000	100	10	8	0
21	36,453	5	105	85	19	54	42	12,500	6,700	2,000	250	2	600	------	------	------	4	1,000	1,000	10	6	0
22	32,899	5	120	85	22	60	43	10,000	5,800	2,000	700	8	1,300	------	------	------	0	100	100	100	6	0
23	36,336	6	300	125	29	71	49	32,000	13,000	2,700	250	6	1,500	------	------	------	1	100	1,000	10	8	0
24	34,249	6	255	165	35	68	52	23,500	17,500	3,300	550	2	2,200	------	------	------	(9)	100	100	10	10	0
25	37,067	6	155	140	26	58	54	32,000	17,000	2,400	1,000	12	1,600	------	------	------	1	100	100	100	10	0
26	37,958	7	300	145	34	48	54	31,000	15,000	2,600	650	11	1,400	------	------	------	2	10,000	1,000	10	10	0
27	37,254	7	325	190	50	49	52	22,500	9,600	1,700	1,100	12	1,800	------	------	------	3	100	1,000	100	10	0
28	36,421	8	210	190	30	69	47	15,000	14,000	2,900	450	8	2,100	------	------	------	3	1,000	100	10	10	0
29	37,249	6	300	165	21	53	45	18,000	9,400	1,700	800	13	1,600	------	------	------	5	10,000	1,000	100	8	0
30	30,492	6	725	220	45	60	44	26,500	12,500	1,100	750	1	1,600	------	------	------	6	1,000	100	10	6	0
31	37,622	8	1,450	460	55	88	45	48,000	18,500	1,900	800	12	5,000	------	------	------	4	1,000	1,000	100	8	0
Mean	36,341	5	375	210	32	55	41	22,760	11,830	2,110	600	8	1,442	------	------	------	3	1,840	913	42	7.2	0
Apr., 1924																					
1	37,616	7	700	500	70	63	45	40,000	21,500	1,800	1,400	11	7,400	------	------	------	7	1,000	100	100	10	0
2	37,530	7	650	465	55	54	43	39,000	12,500	2,000	950	17	3,900	------	------	------	6	100	10,000	100	10	0
3	37,258	8	1,000	475	30	45	38	37,000	17,500	1,600	550	6	4,500	------	------	------	5	1,000	1,000	10	2	0
4	37,761	10	1,000	575	50	57	33	31,000	15,000	850	650	3	2,400	------	------	------	3	1,000	1,000	100	10	0
5	39,485	10	700	535	65	39	28	50,000	15,000	1,500	600	7	2,000	------	------	------	2	1,000	1,000	100	10	0
6	37,887	10	450	400	50	34	23	18,500	11,000	900	500	6	2,500	------	------	------	1	100	100	10	10	0
7	32,969	9	360	325	40	35	19	17,000	9,800	750	120	7	1,500	------	------	------	4	1,000	1,000	10	4	0
8	38,403	10	280	250	30	42	20	14,500	5,300	750	120	2	2,200	------	------	------	1	100	1,000	10	6	0
9	37,605	12	230	220	25	46	22	16,000	9,000	900	120	4	2,500	------	------	------	8	1,000	1,000	100	6	0
10	36,331	10	185	170	30	44	27	7,300	7,400	1,500	100	8	1,500	------	------	------	4	10,000	100	100	6	0
11	36,121	9	140	130	30	47	31	11,500	10,500	1,300	200	7	2,000	------	------	------	1	100	100	10	4	0
12	36,328	10	115	100	20	45	34	17,000	7,000	1,100	90	7	850	------	------	------	0	100	1,000	100	10	0
13	31,951	10	95	85	20	42	37	7,600	3,900	1,400	60	12	1,600	------	------	------	2	1,000	100	100	2	0

[9] Lost.

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923–24—Continued

LOUISVILLE (KY.) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Apr. 1924	*1,000 gallons*	*°C.*																				
14	34, 740	12	85	80	22	37	38	6, 500	2, 500	1, 300	150	6	850	------	------	------	1	1, 000	100	10	6	0
15	37, 376	13	75	60	17	34	37	4, 800	2, 700	1, 400	70	3	1, 400	------	------	------	1	1, 000	100	100	6	0
16	37, 717	14	75	45	12	32	35	4, 800	2, 100	1, 100	130	3	1, 000	------	------	------	1	1, 000	100	100	8	0
17	37, 947	15	85	45	14	34	34	3, 200	2, 300	600	60	0	800	------	------	------	0	100	100	10	6	0
18	35, 797	13	75	50	14	35	32	4, 100	3, 500	600	70	2	700	------	------	------	2	100	100	100	4	0
19	35, 225	12	80	55	12	38	32	2, 600	1, 800	750	24	1	1, 500	------	------	------	0	100	10	10	0	0
20	31, 529	13	75	60	14	41	33	5, 800	3, 300	800	46	2	2, 000	------	------	------	0	100	100	10	0	0
21	35, 361	13	110	50	12	46	34	1, 600	2, 200	900	42	0	2, 000	------	------	------	0	1, 000	100	100	6	0
22	35, 831	13	80	70	15	40	36	4, 000	3, 500	1, 000	80	1	3, 300	------	------	------	0	1, 000	100	100	8	0
23	37, 920	12	110	75	18	52	41	3, 800	2, 200	900	170	3	1, 400	------	------	------	0	100	100	100	10	0
24	36, 302	13	120	80	15	57	44	4, 800	1, 300	750	70	1	600	------	------	------	1	1, 000	1, 000	100	10	0
25	37, 038	15	115	75	20	50	48	2, 600	3, 200	960	600	3	600	------	------	------	0	1, 000	100	10	10	0
26	38, 339	15	100	80	17	46	45	4, 500	1, 900	900	90	3	550	------	------	------	0	100	100	1, 000	6	0
27	31, 143	15	115	85	20	50	45	8, 000	5, 300	960	100	2	1, 300	------	------	------	0	1, 000	1, 000	100	4	0
28	32, 892	16	225	90	25	58	46	16, 000	4, 000	1, 300	110	14	2, 500	------	------	------	1	1, 000	1, 000	100	10	0
29	36, 013	14	205	120	30	58	47	8, 100	6, 200	1, 700	275	26	1, 400	------	------	------	0	1, 000	100	100	8	0
30	35, 900	16	195	130	30	68	48	15, 500	11, 000	1, 600	300	44	2, 400	------	------	------	1	1, 000	1, 000	100	10	0
Mean	35, 953	12	265	185	27	46	36	13, 570	6, 813	1, 128	200	7	1, 972	------	------	------	2	970	757	100	6. 7	0
May, 1924																						
1	35, 663	14	130	100	25	67	50	5, 000	3, 600	1, 200	130	16	1, 000	------	------	------	2	100	1, 000	1, 000	8	0
2	35, [illegible]99	14	205	110	30	66	54	11, 000	4, 400	1, 000	275	11	2, 000	------	------	------	2	1, 000	1, 000	1, 000	6	0
3	34, 145	15	210	125	40	71	56	18, 000	8, 200	1, 100	220	6	7, 000	------	------	------	1	1, 000	100	100	10	0
4	31, 631	16	180	110	50	72	60	15, 000	12, 000	1, 400	300	2	2, 400	------	------	------	2	1, 000	1, 000	100	10	0
5	35, 028	15	155	100	30	61	62	10, 500	4, 700	1, 800	120	3	1, 800	------	------	------	0	1, 000	1, 000	100	10	0
6	37, 713	17	220	95	40	53	58	7, 200	5, 200	1, 700	230	6	1, 700	------	------	------	4	10, 000	1, 000	100	10	0
7	37, 774	17	175	90	40	42	50	4, 800	4, 700	1, 300	275	3	1, 200	------	------	------	4	1, 000	100	1, 000	10	0
8	35, 739	16	135	75	25	48	52	5, 800	3, 200	1, 100	110	9	600	------	------	------	3	100	1, 000	100	10	0
9	35, 793	14	240	80	25	48	49	6, 700	4, 800	800	90	7	1, 900	------	------	------	1	1, 000	1, 000	100	10	0
10	34, 636	14	115	85	30	46	46	10, 000	2, 200	500	20	5	2, 600	------	------	------	6	1, 000	100	100	2	0

11	30, 096	14	100	85	25	54	41	9, 600	5, 500	1, 300	240	3	4, 100	-------	-------	-------	2	10, 000	1, 000	100	8	0
12	36, 648	14	120	80	30	58	45	11, 000	3, 800	1, 400	240	2	3, 800	-------	-------	-------	14	10, 000	100	100	10	10
13	37, 342	15	125	80	25	60	48	10, 500	2, 400	950	160	3	4, 300	-------	-------	-------	2	1, 000	1, 000	100	10	0
14	37, 244	15	105	80	25	56	48	8, 500	3, 900	1, 900	220	1	1, 400	-------	-------	-------	1	1, 000	100	100	10	0
15	35, 441	15	120	85	25	44	48	7, 000	2, 800	1, 000	180	2	650	-------	-------	-------	2	100	1, 000	100	8	0
16	36, 197	15	195	70	15	28	48	9, 800	3, 300	750	110	0	1, 500	-------	-------	-------	1	1, 000	100	100	10	0
17	32, 293	14	300	65	18	26	40	11, 500	1, 700	1, 200	170	0	1, 100	-------	-------	-------	0	10, 000	100	10	10	0
18	34, 014	15	290	75	23	22	39	6, 100	1, 300	275	18	0	1, 200	-------	-------	-------	1	1, 000	1, 000	10	0	0
19	35, 021	13	200	90	26	23	31	14, 500	3, 200	3, 200	75	0	900	-------	-------	-------	0	100	100	100	6	0
20	35, 340	14	210	90	30	23	24	9, 000	7, 100	3, 900	170	0	900	-------	-------	-------	1	100	100	10	10	0
21	35, 916	14	150	90	35	28	23	1, 3000	7, 600	2, 500	120	0	1, 100	-------	-------	-------	1	1, 000	100	100	8	0
22	36, 534	14	110	80	30	34	22	6, 200	5, 500	2, 200	44	1	1, 500	-------	-------	-------	2	1, 000	100	100	10	0
23	36, 517	14	120	75	25	42	24	6, 300	3, 700	2, 600	90	1	2, 100	-------	-------	-------	1	1, 000	1, 000	100	10	0
24	34, 516	16	200	75	30	44	30	8, 700	4, 400	2, 800	95	1	3, 200	-------	-------	-------	2	1, 000	1, 000	100	10	0
25	30, 808	14	210	80	30	47	31	10, 500	2, 700	650	130	3	5, 600	-------	-------	-------	1	1, 000	100	100	10	0
26	33. 552	14	170	75	30	48	37	11, 500	5, 600	2, 800	150	4	2, 200	-------	-------	-------	1	10, 000	1, 000	100	10	0
27	36, 187	16	160	75	25	44	39	6. 000	4, 400	2, 900	190	1	2, 200	-------	-------	-------	2	10, 000	1, 000	100	6	0
28	35, 610	16	120	70	30	48	38	7, 200	2, 200	1, 600	210	3	2, 300	-------	-------	-------	5	1, 000	100	100	10	0
29	35, 279	17	130	70	25	45	38	5, 400	3, 500	1, 700	80	4	1, 100	-------	-------	-------	1	1, 000	1, 000	100	10	0
30	33, 760	15	90	65	25	44	38	8, 700	4, 400	1, 800	170	6	1, 800	-------	-------	-------	1	1, 000	1, 000	100	10	0
31	31, 408	16	85	60	20	46	42	4, 400	2, 400	2. 100	180	4	3, 000	-------	-------	-------	2	1, 000	100	100	10	0
Mean	34, 946	15	165	67	29	46	41	9, 013	4, 335	1, 660	153	3	2, 200	-------	-------	-------	2	2, 600	594	178	8. 8	0. 32
June, 1924																						
1	31, 566	17	85	60	25	49	42	5, 000	1, 600	1, 400	48	0	3, 000	-------	-------	-------	0	100	100	100	10	0
2	36, 504	17	135	60	20	55	43	10, 000	2, 800	2, 200	220	0	2, 100	-------	-------	-------	0	1, 000	1, 000	100	10	0
3	35, 874	17	235	70	25	50	46	9, 400	2, 900	2, 400	160	3	1, 600	-------	-------	-------	0	1, 000	100	100	10	0
4	37, 016	17	370	80	45	42	45	7, 600	2, 700	1, 900	170	0	1, 300	-------	-------	-------	1	1, 000	100	100	10	0
5	38, 450	18	390	100	30	37	43	6, 400	3, 200	1, 600	110	2	1, 500	-------	-------	-------	1	10, 000	1, 000	100	10	0
6	38, 917	18	325	115	30	51	40	18, 000	2, 400	1, 200	60	0	3, 800	-------	-------	-------	0	10, 000	1, 000	1, 000	10	0
7	37, 833	17	240	125	45	54	39	9, 000	5, 500	1, 700	180	2	3, 300	-------	-------	-------	0	1, 000	10, 000	1, 000	10	0
8	34, 799	21	220	110	40	55	41	14, 000	1, 0500	1, 500	180	3	3, 000	-------	-------	-------	0	10, 000	100	1, 000	10	0
9	39, 119	21	275	110	35	72	42	17, 000	11, 000	3, 100	210	2	4, 100	-------	-------	-------	0	1, 000	1, 000	100	10	0
10	35, 557	21	260	120	30	74	48	13, 000	5, 200	2, 200	150	3	3, 800	-------	-------	-------	3	10, 000	1, 000	1, 000	10	0
11	42, 220	21	390	130	30	75	49	14, 000	5, 000	2, 000	80	7	3, 800	-------	-------	-------	3	1 000	100	100	8	0
12	39, 368	21	925	180	45	91	58	49, 000	4, 400	1, 400	150	5	13, 000	-------	-------	-------	3	1, 000	100	100	10	0
13	39, 953	22	1, 000	230	55	87	63	36, 000	6, 000	1, 500	120	1	6, 600	-------	-------	-------	1	10, 000	100	100	10	0
14	38, 870	22	925	250	60	76	64	21, 500	5, 000	1, 500	90	13	3, 800	-------	-------	-------	3	1, 000	100	100	10	0
15	31, 635	21	625	245	65	64	61	16, 000	6, 800	700	180	6	7, 400	-------	-------	-------	5	1, 000	1, 000	1, 000	10	0
16	39, 731	22	560	230	60	61	53	12, 000	5, 500	800	110	5	3, 200	-------	-------	-------	2	10, 000	1, 000	100	10	0
17	38, 567	21	490	235	70	67	50	12, 500	4, 600	1, 200	180	5	3, 000	-------	-------	-------	1	10, 000	1, 000	100	6	0
18	40, 659	22	510	235	50	67	46	10, 000	4, 400	5, 400	60	-------	2, 300	-------	-------	-------	3	1, 000	10, 000	1, 000	10	0
19	40, 312	23	560	240	65	64	46	9, 800	3, 800	850	48	4	1, 600	-------	-------	-------	2	10, 000	1, 000	1, 000	10	0
20	40, 950	24	450	240	60	59	43	9, 700	5, 200	850	55	3	2, 000	-------	-------	-------	0	1, 000	100	100	10	0
21	38, 490	24	350	255	75	70	43	11, 000	4, 600	900	60	2	5, 700	-------	-------	-------	1	1, 000	1, 000	100	10	0
22	36, 087	24	215	225	60	64	46	8, 000	3, 400	600	120	6	4, 000	-------	-------	-------	1	10, 000	10, 000	100	10	0
23	36, 645	25	185	200	55	66	45	6, 300	3, 600	800	120	1	5, 000	-------	-------	-------	0	10, 000	1, 000	1, 000	10	0
24	37, 320	23	150	195	25	62	46	8, 000	4, 000	1, 100	40	2	3, 700	-------	-------	-------	1	1, 000	1, 000	1, 000	8	0
25	39, 784	24	125	145	25	74	54	4, 600	4, 200	1, 500	100	5	4, 800	-------	-------	-------	0	1, 000	1, 000	100	10	0

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923-24—Continued

LOUISVILLE (KY) WATER FILTRATION PLANT

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
June, 1923	*1,000 gallons*	° *C.*																				
26	36, 939	25	150	150	35	80	61	4, 000	1, 700	1, 400	160	0	2, 800	------	------	------	------	10, 000	1, 000	100	10	0
27	40, 035	26	235	135	60	88	62	4, 400	2, 200	1, 000	125	15	1, 300	------	------	------	10	1, 000	100	100	10	0
28	37, 227	25	185	150	60	82	68	7, 700	8, 600	1, 600	160	5	3, 600	------	------	------	1	1, 000	100	100	10	0
29	34, 794	26	190	155	25	85	70	6, 700	5, 200	600	140	5	2, 800	------	------	------	3	10, 000	100	100	10	0
30	36, 906	24	350	165	25	84	74	6, 200	5, 800	900	150	5	3, 400	------	------	------	2	100	1, 000	100	6	0
Mean	37, 737	22	370	163	44	67	51	12, 227	4, 726	1, 527	125	4	3, 673	------	------	------	1. 6	4, 540	1, 540	370	9. 6	0
July, 1924																						
1	38, 962	22	475	250	40	87	79	10, 000	2, 400	800	140	2	4, 500	------	------	------	1	1, 000	1, 000	100	10	0
2	39, 934	22	500	350	80	95	80	10, 000	4. 000	1, 200	120	7	5, 400	------	------	------	13	1, 000	1, 000	100	10	0
3	41, 249	23	425	300	70	84	72	9, 000	4, 900	900	190	9	5, 200	------	------	------	5	1, 000	1, 000	1, 000	10	0
4	31, 752	22	735	290	65	75	68	9, 500	5. 000	2, 300	380	10	3, 400	------	------	------	8	1, 000	10, 000	1, 000	10	0
5	38, 043	22	1, 000	460	50	60	59	18. 000	6, 000	1, 600	220	8	11, 000	------	------	------	6	1. 000	1. 000	100	10	0
6	33, 268	22	600	445	25	41	45	9, 000	8. 500	700	150	1	7, 800	------	------	------	1	10, 000	10, 000	1, 000	8	0
7	40, 716	23	575	300	30	44	39	7, 000	6, 000	220	120	2	4, 300	------	------	------	0	1, 000	10, 000	100	6	0
8	41, 592	22	255	265	18	44	36	6, 200	5. 500	250	65	0	1, 800	------	------	------	0	1, 000	10. 000	100	8	0
9	41, 354	23	255	210	19	40	37	3, 400	3, 500	650	60	0	1, 350	------	------	------	0	1, 000	10, 000	100	10	0
10	41, 136	23	255	190	35	47	37	3. 700	1, 200	250	70	0	2, 300	------	------	------	0	1. 000	1, 000	100	10	0
11	41, 383	23	275	200	40	57	45	4, 000	3, 000	800	80	4	1, 800	------	------	------	0	10, 000	1, 000	100	8	0
12	40, 427	24	255	205	35	54	48	5, 800	5, 000	500	125	2	6, 000	------	------	------	1	1, 000	1, 000	1. 000	8	0
13	32, 385	24	240	190	60	53	48	4, 600	4, 000	1, 300	220	1	4, 300	------	------	------	4	1. 000	10, 000	100	6	0
14	37, 883	24	285	175	35	48	44	4, 400	3. 400	900	210	2	6, 600	------	------	------	5	1, 000	1, 000	100	8	0
15	40, 587	24	465	250	50	52	46	2, 800	4, 200	1, 200	400	2	7, 700	------	------	------	0	10, 000	1, 000	100	10	2
16	38, 386	23	440	335	65	57	46	7, 700	6, 200	950	300	3	1, 600	------	------	------	0	1, 000	10, 000	1, 000	10	2
17	39, 527	23	575	335	65	58	45	4, 900	5, 000	500	95	3	1, 200	------	------	------	0	1, 000	100	100	10	0
18	38, 108	23	450	380	45	57	44	10, 500	7, 500	150	32	3	1, 700	------	------	------	0	10, 000	100	100	8	0
19	38, 815	23	285	305	30	57	41	6, 000	7, 000	350	38	1	5, 200	------	------	------	0	1, 000	100	100	6	0
20	35, 058	24	160	200	30	52	42	5, 800	7, 000	900	65	0	3, 300	------	------	------	0	10, 000	1, 000	100	10	0
21	42, 139	26	120	145	40	50	43	5, 600	2, 800	500	85	0	4, 000	------	------	------	2	1, 000	1, 000	100	8	0
22	43, 809	25	100	110	30	45	40	3, 600	2, 600	600	70	3	3, 200	------	------	------	1	1, 000	100	100	10	0

23	44, 002	25	80	85	25	45	40	1, 700	1, 700	700	70	2	2, 400	-------	-------	-------	0	10, 000	10, 000	100	8	0
24	43, 859	24	75	85	25	47	40	1, 600	1, 600	600	60	5	1, 800	-------	-------	-------	2	100	1, 000	100	8	0
25	43, 367	26	75	75	22	48	43	800	500	180	55	1	1, 400	-------	-------	-------	0	100	100	100	8	0
26	41, 257	24	60	65	25	51	45	1, 000	800	425	40	1	525	-------	-------	-------	1	100	100	10	8	0
27	37, 609	25	50	50	25	56	46	900	800	375	65	3	675	-------	-------	-------	0	100	100	100	6	0
28	41, 854	25	35	35	25	64	52	150	1, 100	325	95	1	230	-------	-------	-------	0	10	10	100	8	0
29	49, 086	25	20	18	14	68	61	3, 300	1, 500	2, 100	150	1	2, 600	-------	-------	-------	4	10	10	0	2	0
30	51, 033	26	20	12	11	71	67	1, 600	175, 000	70, 000	48, 000	8	2, 400	-------	-------	-------	10	10	0	1, 000	10	0
31	46, 262	26	15	10	10	71	72	1, 600	80, 000	32, 000	56, 000	70	2, 400	-------	-------	-------	95	0	0	100	4	0
Mean	40, 491	24	300	190	36	58	50	5, 295	3, 886	766	130	5	3, 531	-------	-------	-------	5. 2	2, 500	2, 990	268	8. 2	0. 1
Aug., 1924																						
1	46, 696	26	10	12	11	60	71	3, 200	110, 000	78, 000	40, 000	15	2, 900	-------	-------	-------	35	10	0	0	0	0
2	43, 009	26	17	12	11	62	68	500	28, 000	26, 000	8, 000	17	1, 000	-------	-------	-------	2	100	0	0	0	0
3	37, 159	26	12	11	10	60	65	220	20, 000	16, 000	5, 800	9	1, 300	-------	-------	-------	6	0	0	0	2	0
4	46, 601	25	25	12	11	62	62	2, 100	1,200,000	16, 500	36, 000	6	1, 800	-------	-------	-------	5	0	0	0	0	0
5	47, 891	27	25	16	16	62	63	2, 100	7, 600	19, 000	115, 000	8	2, 000	-------	-------	-------	14	100	0	0	0	0
6	48, 523	27	32	22	19	64	62	1, 900	1, 600	3, 600	120, 000	6	2, 200	-------	-------	-------	6	0	0	0	0	0
7	44, 472	27	32	25	24	65	63	9, 200	3, 600	3, 100	2, 400	9	1, 500	-------	-------	-------	9	10	0	0	0	0
8	45, 679	28	23	22	19	66	65	1, 000	4, 000	2, 600	475	6	1, 800	-------	-------	-------	7	10	0	0	0	0
9	43, 659	26	18	19	15	71	66	1, 300	72, 000	52, 000	3, 400	5	1, 500	-------	-------	-------	4	10	0	0	0	0
10	39, 238	26	12	14	15	71	70	450	28, 000	50, 000	2, 800	3	360	-------	-------	-------	10	10	0	0	0	0
11	43, 583	26	12	14	12	70	69	650	29, 500	11, 500	1, 800	4	1, 400	-------	-------	-------	9	10	0	0	2	0
12	45, 172	25	13	15	12	70	71	550	4, 300	5, 500	1, 300	3	1, 000	-------	-------	-------	5	0	0	0	0	0
13	44, 430	24	16	15	12	71	71	400	400	700	600	4	850	-------	-------	-------	2	10	0	0	0	0
14	44, 674	24	17	15	6	69	61	300	1, 300	1, 000	20	7	500	-------	-------	-------	3	10	0	0	0	0
15	46, 117	24	15	9	9	67	69	350	800	1, 000	300	3	425	-------	-------	-------	2	10	0	0	0	0
16	43, 683	26	17	6	7	65	69	550	850	970	250	4	800	-------	-------	-------	1	0	0	0	0	0
17	38, 697	24	19	9	9	59	69	375	750	700	275	5	800	-------	-------	-------	2	1, 000	0	0	0	0
18	46, 319	24	21	9	6	55	65	240	350	300	300	5	500	-------	-------	-------	3	10	0	0	0	0
19	48, 802	24	9	8	7	70	63	750	800	950	400	4	750	-------	-------	-------	2	0	0	0	0	0
20	47, 324	26	7	7	6	73	64	350	750	950	650	6	575	-------	-------	-------	3	0	0	0	0	0
21	45, 451	24	7	6	6	75	68	600	3, 000	2, 300	700	5	550	-------	-------	-------	2	10	0	0	2	0
22	45, 331	26	7	5	5	75	66	500	3, 700	1, 800	1, 300	5	325	-------	-------	-------	1	10	0	0	0	0
23	44, 216	26	8	3	4	72	72	450	4, 000	5, 200	650	11	370	-------	-------	-------	20	10	0	0	0	0
24	39, 111	25	13	5	3	67	72	700	8, 400	6, 400	500	7	650	-------	-------	-------	3	10	0	0	0	0
25	44, 162	26	28	10	8	72	70	1, 500	11, 500	4, 400	400	1	1, 600	-------	-------	-------	3	100	0	0	0	0
26	45, 549	25	50	16	20	65	68	1, 200	3, 800	11, 000	650	4	1, 100	-------	-------	-------	9	1. 000	0	0	0	0
27	45, 928	24	120	80	32	60	63	1, 900	7, 500	6, 200	250	8	2, 200	-------	-------	-------	3	1, 000	1, 000	10	0	0
28	45, 427	25	130	105	26	59	59	3, 200	3, 200	3, 600	700	2	2, 500	-------	-------	-------	4	100	100	100	6	0
29	46, 023	25	105	90	20	57	55	11, 500	24, 000	1, 600	280	3	1, 500	-------	-------	-------	0	100	100	100	2	0
30	45, 323	25	100	85	30	53	53	2, 000	7, 500	2, 400	300	1	1, 700	-------	-------	-------	1	1. 000	100	100	10	0
31	42, 090	26	85	75	25	47	54	5, 200	10, 500	1, 300	150	4	1, 500	-------	-------	-------	0	1. 000	0	10	4	0
Mean	44, 527	26	32	24	14	65	65	1, 782	51, 668	10, 860	11, 150	6	1, 224	-------	-------	-------	6	182	42	10	0. 9	0

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923–24—Continued

EVANSVILLE (IND.) WATER FILTRATION PLANT

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
July, 1923	*1,000 gallons*	° C.																				
1	7,386	22	65	......	25	62	66	1,000	......	350	......	1	1,950	......	1,320	......	3	100	......	100	......	0
2	9,831	22	60	......	25	57	59	1,600	......	250	......	3	1,600	......	1,670	......	7	100	......	100	......	0
3	9,566	22	50	......	20	60	60	900	......	180	......	2	2,000	......	1,050	......	6	100	......	100	......	0
4	7,558	22	80	......	15	65	65	2,000	......	350	......	3	1,800	......	710	......	8	100	......	100	......	0
5	9,096	22	65	......	20	69	70	1,200	......	400	......	1	2,000	......	750	......	8	100	......	100	......	2
6	9,844	22	65	......	20	70	70	1,700	......	800	......	4	1,700	......	750	......	5	550	......	100	......	0
7	10,741	27	50	......	20	65	71	2,500	......	645	......	5	1,800	......	760	......	4	550	......	100	......	0
8	7,803	27	85	......	20	63	66	3,800	......	450	......	6	3,700	......	640	......	5	550	......	100	......	2
9	10,566	27	160	......	40	59	62	1,600	......	550	......	4	3,700	......	1,460	......	6	1,000	......	100	......	0
10	10,062	27	150	......	28	55	55	2,300	......	350	......	5	2,150	......	575	......	13	5,500	......	100	......	0
11	10,379	27	100	......	26	56	59	2,000	......	350	......	3	2,700	......	370	......	2	1,000	......	100	......	0
12	10,034	27	350	......	37	62	58	2,400	......	600	......	3	2,600	......	860	......	3	1,000	......	100	......	0
13	9,746	27	320	......	45	58	59	2,500	......	480	......	1	4,500	......	1,200	......	3	1,000	......	100	......	0
14	9,444	27	110	......	20	58	63	4,300	......	850	......	9	3,500	......	700	......	13	550	......	100	......	2
15	7,632	27	75	......	15	60	63	3,000	......	350	......	2	2,400	......	850	......	7	550	......	100	......	0
16	9,622	30	90	......	20	58	59	2,000	......	200	......	3	2,000	......	960	......	8	5,050	......	100	......	0
17	10,252	30	95	......	20	60	60	1,900	......	200	......	3	1,200	......	550	......	25	550	......	100	......	2
18	10,498	30	200	......	20	58	58	3,500	......	550	......	10	3,500	......	1,450	......	12	5,500	......	100	......	0
19	10,357	30	230	......	20	60	58	2,100	......	250	......	4	6,200	......	350	......	8	550	......	100	......	0
20	10,284	30	320	......	20	70	68	2,000	......	200	......	6	4,200	......	560	......	7	1,000	......	100	......	0
21	9,693	30	190	......	15	70	62	3,500	......	350	......	2	3,700	......	880	......	4	1,000	......	100	......	0
22	7,639	30	130	......	15	69	62	2,200	......	450	......	14	3,700	......	1,800	......	3	5,500	......	100	......	0
23	10,163	29	125	......	25	67	60	2,000	......	800	......	5	2,200	......	1,500	......	5	1,000	......	50	......	0
24	10,376	29	118	......	27	68	66	3,200	......	620	......	6	2,300	......	1,800	......	6	5,500	......	100	......	0
25	10,281	29	100	......	25	66	68	2,000	......	280	......	4	3,500	......	1,206	......	6	5,500	......	100	......	2
26	10,378	29	95	......	27	65	61	1,200	......	540	......	4	2,000	......	1,100	......	43	1,000	......	100	......	0
27	10,544	29	75	......	22	65	65	1,500	......	280	......	3	2,400	......	1,500	......	3	10,000	......	100	......	0
28	9,336	28	45	......	25	61	67	1,700	......	300	......	8	1,200	......	1,000	......	8	550	......	50	......	0
29	7,104	28	50	......	18	62	69	1,200	......	250	......	4	1,500	......	530	......	17	5,500	......	100	......	2
30	9,384	28	65	......	25	64	66	1,000	......	280	......	2	1,200	......	1,400	......	12	5,500	......	100	......	0
31	9,909	28	95	......	25	66	69	900	......	200	......	2	1,200	......	1,735	......	4	550	......	50	......	0
Mean	9,531	27	123	......	24	63	63	2,058	......	433	......	4	2,584	......	1,029	......	8	2,160	......	95	......	0.39

Aug., 1923																						
1	10,548	28	85	......	22	68	68	800	......	230	......	6	1,200	......	350	......	8	550	......	100	......	0
2	9,854	28	70	......	18	70	69	1,000	......	500	......	3	1,500	......	800	......	5	10,000	......	100	......	2
3	9,846	28	80	......	22	65	71	2,000	......	1,200	......	13	2,000	......	700	......	16	550	......	100	......	0
4	9,176	28	55	......	20	67	62	1,700	......	1,500	......	13	3,000	......	1,300	......	14	5,500	......	100	......	0
5	7,729	29	60	......	15	67	66	3,500	......	800	......	55	2,300	......	1,200	......	50	5,500	......	100	......	4
6	9,650	28	120	......	20	63	63	2,700	......	1,200	......	7	4,100	......	1,100	......	10	1,000	......	100	......	0
7	9,852	28	85	......	18	65	67	1,000	......	230	......	10	2,000	......	1,200	......	9	100	......	100	......	0
8	10,070	29	120	......	20	64	65	1,500	......	300	......	6	2,500	......	1,000	......	13	1,000	......	100	......	0
9	9,692	30	130	......	20	62	60	1,500	......	750	......	7	2,500	......	950	......	8	1,000	......	100	......	0
10	8,696	30	140	......	20	53	55	4,000	......	450	......	5	4,800	......	1,500	......	7	5,500	......	100	......	0
11	8,805	30	150	......	20	53	53	4,500	......	700	......	8	4,000	......	1,200	......	5	5,500	......	100	......	0
12	7,391	30	180	......	25	51	50	3,300	......	650	......	5	5,200	......	1,900	......	4	5,500	......	100	......	0
13	9,911	30	220	......	27	52	48	2,400	......	425	......	4	2,400	......	1,600	......	4	1,000	......	100	......	0
14	9,981	30	180	......	27	55	51	1,900	......	230	......	1	3,500	......	1,500	......	5	1,000	......	100	......	0
15	9,466	30	190	......	27	49	49	1,700	......	350	......	3	2,700	......	500	......	2	5,500	......	100	......	0
16	8,998	30	170	......	25	45	45	2,700	......	230	......	2	20,000	......	2,000	......	7	1,000	......	100	......	0
17	8,676	29	170	......	25	41	38	20,000	......	750	......	4	25,000	......	2,700	......	4	10,000	......	100	......	0
18	8,682	28	220	......	27	40	40	9,500	......	800	......	3	12,500	......	2,800	......	9	10,000	......	100	......	0
19	7,232	28	300	......	25	45	44	13,000	......	1,500	......	6	12,500	......	2,800	......	4	10,000	......	100	......	0
20	9,396	28	450	......	25	50	48	3,000	......	500	......	6	4,000	......	1,500	......	4	5,500	......	100	......	0
21	9,265	28	450	......	27	50	41	3,700	......	425	......	1	7,200	......	1,400	......	10	10,000	......	100	......	0
22	8,815	27	450	......	27	42	32	2,000	......	120	......	4	6,700	......	1,600	......	4	5,500	......	100	......	0
23	8,704	26	360	......	25	38	34	2,600	......	1,800	......	6	8,500	......	1,300	......	12	1,000	......	100	......	0
24	8,553	26	260	......	27	41	35	2,100	......	250	......	8	7,500	......	1,600	......	6	10,000	......	100	......	0
25	8,332	26	240	......	27	43	41	4,200	......	475	......	8	3,400	......	1,000	......	3	5,500	......	100	......	0
26	7,052	26	170	......	25	50	50	4,500	......	275	......	6	4,000	......	950	......	6	1,000	......	100	......	0
27	9,035	26	180	......	26	43	38	1,800	......	220	......	7	5,400	......	1,100	......	8	10,000	......	100	......	0
28	9,192	26	130	......	27	49	43	1,500	......	250	......	3	2,900	......	890	......	18	5,500	......	100	......	2
29	9,042	26	120	......	25	51	50	1,000	......	200	......	7	5,700	......	1,700	......	15	5,500	......	100	......	0
30	9,301	26	100	......	32	49	48	2,000	......	275	......	6	10,000	......	2,300	......	5	5,500	......	100	......	0
31	9,255	22	100	......	32	52	48	2,800	......	500	......	9	11,700	......	2,500	......	7	5,500	......	100	......	0
Mean	9,039	28	185	......	24	53	51	3,545	......	572	......	8	5,745	......	1,559	......	9	4,860	......	100	......	0.26
Sept., 1923																						
1	8,513	27	100	......	27	53	47	3,400	......	1,000	......	8	7,000	......	1,800	......	15	5,500	......	100	......	0
2	6,900	26	90	......	26	57	52	5,000	......	1,100	......	7	9,200	......	2,500	......	15	1,000	......	100	......	0
3	6,945	26	85	......	26	57	52	4,200	......	1,800	......	4	10,000	......	2,300	......	7	1,000	......	100	......	0
4	9,395	26	85	......	26	60	54	4,100	......	1,200	......	4	8,700	......	2,000	......	7	10,000	......	100	......	0
5	9,534	26	85	......	28	66	66	2,000	......	900	......	20	5,000	......	2,000	......	50	5,500	......	100	......	6
6	9,170	26	85	......	20	70	64	2,500	......	500	......	6	8,700	......	3,000	......	16	5,500	......	100	......	0
7	9,159	26	95	......	28	70	70	8,400	......	650	......	13	10,000	......	2,800	......	60	5,500	......	100	......	4
8	8,691	26	95	......	30	72	72	4,000	......	550	......	8	10,000	......	2,500	......	8	5,500	......	100	......	0
9	7,876	25	140	......	28	74	72	2,400	......	325	......	5	6,000	......	3,500	......	40	10,000	......	100	......	0
10	9,759	25	120	......	45	74	70	1,800	......	350	......	8	5,700	......	3,000	......	15	550	......	100	......	0
11	10,016	25	150	......	35	78	75	1,000	......	250	......	6	5,000	......	3,500	......	15	1,000	......	100	......	0
12	9,815	25	140	......	30	77	73	900	......	180	......	5	5,000	......	1,200	......	30	5,500	......	100	......	0
13	9,493	24	140	......	29	78	78	1,000	......	150	......	15	9,300	......	1,700	......	38	10,000	......	100	......	2
14	9,723	23	130	......	27	74	74	800	......	200	......	6	4,100	......	1,200	......	35	1,000	......	100	......	0
15	9,514	22	135	......	45	74	73	1,600	......	300	......	6	3,500	......	1,400	......	16	5,500	......	100	......	0

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923–24—Continued

EVANSVILLE (IND.) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Sept. 1923	*1,000 gallons*	*° C.*																				
16	6,515	22	125	------	27	76	75	1,600	------	230	------	9	2,000	------	900	------	5	5,500	------	100	------	0
17	9,313	22	80	------	28	78	78	1,000	------	375	------	8	2,100	------	1,000	------	12	100	------	100	------	0
18	8,557	22	95	------	32	84	78	1,000	------	180	------	8	2,700	------	700	------	7	1,000	------	100	------	0
19	8,681	23	70	------	24	85	84	1,000	------	150	------	16	1,900	------	1,000	------	58	1,000	------	50	------	0
20	8,801	23	50	------	25	80	80	600	------	250	------	10	1,600	------	1,100	------	7	1,000	------	100	------	0
21	8,561	22	45	------	18	72	71	1,000	------	275	------	6	2,000	------	1,200	------	9	1,000	------	100	------	0
22	8,166	22	50	------	20	72	72	1,500	------	400	------	4	5,000	------	1,200	------	4	1,000	------	100	------	0
23	6,266	22	50	------	20	74	75	1,600	------	450	------	4	4,000	------	1,300	------	5	550	------	100	------	0
24	9,590	22	40	------	20	74	72	1,000	------	500	------	4	2,000	------	900	------	4	550	------	100	------	0
25	9,308	23	60	------	20	75	70	700	------	400	------	8	1,400	------	900	------	10	100	------	100	------	0
26	9,264	24	35	------	18	76	74	1,600	------	450	------	12	5,000	------	650	------	30	550	------	50	------	0
27	9,384	24	26	------	20	76	76	900	------	600	------	24	3,000	------	1,200	------	15	550	------	50	------	0
28	9,841	25	26	------	18	78	75	1,000	------	1,000	------	9	1,000	------	1,200	------	8	100	------	100	------	0
29	9,351	25	26	------	18	71	70	1,000	------	1,000	------	9	1,400	------	700	------	7	100	------	100	------	0
30	7,904	24	25	------	15	68	60	900	------	1,400	------	12	2,500	------	2,000	------	12	550	------	100	------	0
Mean	8,801	24	83	------	26	72	70	1,816	------	567	------	9	4,826	------	1,678	------	19	2,890	------	95	------	0.4
Oct., 1923																						
1	9,588	24	25	------	25	68	60	900	------	500	------	6	1,300	------	1,800	------	14	100	------	100	------	0
2	9,861	24	25	------	25	66	58	800	------	100	------	6	1,200	------	2,200	------	14	100	------	100	------	0
3	9,525	23	15	------	15	66	60	800	------	200	------	10	2,200	------	1,600	------	16	550	------	100	------	0
4	9,265	22	15	------	15	68	60	600	------	100	------	9	1,000	------	1,500	------	9	550	------	100	------	0
5	9,079	21	15	------	15	78	78	600	------	40	------	5	1,000	------	1,000	------	5	1,000	------	100	------	0
6	8,600	21	15	------	15	80	74	500	------	60	------	6	1,000	------	2,000	------	14	100	------	100	------	0
7	6,506	20	15	------	15	83	76	500	------	50	------	3	1,100	------	2,400	------	4	500	------	50	------	0
8	9,311	20	15	------	15	84	75	500	------	100	------	6	700	------	1,600	------	14	500	------	50	------	0
9	8,632	19	15	------	15	84	80	500	------	350	------	6	500	------	1,400	------	8	5,500	------	100	------	0
10	8,715	19	15	------	15	78	76	700	------	80	------	10	7,000	------	1,100	------	8	50	------	50	------	0
11	8,810	19	15	------	15	74	72	500	------	50	------	5	6,800	------	1,100	------	10	550	------	100	------	0
12	8,782	20	15	------	15	76	71	500	------	240	------	10	2,500	------	700	------	10	550	------	100	------	0
13	8,056	20	15	------	15	74	68	500	------	140	------	10	2,400	------	1,000	------	4	550	------	100	------	0
14	6,188	20	15	------	15	75	70	500	------	220	------	3	2,100	------	1,200	------	8	100	------	50	------	0
15	9,308	20	15	------	15	78	73	300	------	150	------	3	4,200	------	1,000	------	7	50	------	100	------	0

16	9,000	20	15		15	78	72	300		120		4	2,000		1,200		8	100		100		0
17	8,606	20	15		15	80	77	300		200		5	700		350		5	100		50		0
18	8,420	20	15		15	78	74	400		100		4	700		700		9	550		50		0
19	8,561	19	50		20	70	73	700		200		8	900		375		5	1,000		100		0
20	7,918	18	160		25	68	65	4,300		3,000		10	6,000		2,000		7	10,000		100		0
21	6,554	17	90		28	62	52	1,700		1,100		4	5,000		960		6	5,500		100		0
22	8,851	16	70		25	60	50	500		370		6	2,700		800		7	550		100		0
23	8,365	16	65		25	62	58	800		450		4	2,300		400		4	550		100		0
24	8,445	16	55		30	60	60	800		300		10	1,500		400		12	550		100		0
25	8,392	15	37		25	67	60	600		300		5	1,100		300		10	1,000		50		0
26	8,551	15	30		25	70	67	1,000		250		5	1,600		350		8	1,000		50		0
27	7,927	15	25		15	77	75	500		130		4	1,800		500		8	1,000		100		0
28	6,570	14	25		15	78	77	600		200		5	1,500		400		6	550		100		0
29	9,528	14	20		15	80	79	500		100		5	1,200		350		4	5,500		50		0
30	9,172	14	15		15	83	83	400		80		2	2,000		240		6	550		100		0
31	9,722	13	15		15	85	78	300		140		2	1,000		300		5	550		100		0
Mean	8,542	18	30		18	74	69	722		305		6	2,161		1,007		8	1,280		86		0
Nov., 1923																						
1	9,544	12	15		15	86	86	300		100		2	2,000		240		3	100		100		0
2	9,108	12	15		15	88	88	500		50		4	1,000		80		6	100		0		0
3	9,073	12	15		15	90	88	400		50		3	600		120		3	550		50		0
4	7,236	12	18		15	91	90	400		60		4	800		120		2	100		100		0
5	8,736	12	45		15	75	70	9,000		1,100		7	3,500		400		8	10,000		100		0
6	8,588	12	65		27	82	75	14,000		3,000		14	3,800		1,200		27	10,000		100		2
7	8,672	11	140		60	62	62	12,500		3,000		5	6,300		1,000		9	1,000		100		0
8	8,704	10	100		28	58	48	7,000		1,500		3	10,000		1,400		15	5,500		100		0
9	8,795	10	60		50	61	55	10,500		2,000		8	9,000		1,100		11	550		100		0
10	7,823	10	40		15	70	60	2,000		650		5	9,000		350		8	550		100		0
11	6,605	10	35		15	78	72	1,500		850		7	10,000		750		10	100		100		0
12	9,148	10	45		15	90	83	2,000		120		5	7,500		500		4	100		100		0
13	8,484	10	45		15	94	86	2,500		250		4	2,000		350		14	550		100		0
14	8,452	10	48		15	97	95	1,600		100		4	1,500		250		12	100		100		0
15	8,576	10	30		15	94	93	1,000		70		3	1,000		140		13	100		100		0
16	8,824	10	30		15	84	83	600		190		4	1,000		180		12	1,000		100		0
17	8,266	10	30		15	84	77	500		120		4	1,000		140		4	100		50		0
18	6,186	10	25		15	78	77	700		80		5	1,000		120		8	100		0		0
19	8,722	10	20		15	74	67	600		60		4	800		150		6	100		100		0
20	8,126	10	20		15	74	74	500		30		4	900		180		11	50		50		0
21	7,942	10	20		15	72	72	600		70		4	700		100		4	100		50		0
22	7,742	10	20		15	67	61	600		150		4	500		80		4	100		0		0
23	8,002	10	20		15	72	70	600		140		3	4,500		100		3	550		50		0
24	7,395	9	20		15	68	64	500		100		6	7,000		120		5	100		100		0
25	5,762	9	20		15	71	68	600		50		3	7,800		130		5	550		50		0
26	8,384	9	20		15	67	63	600		42		3	8,000		150		6	100		50		0
27	8,099	9	20		15	67	62	500		200		3	10,000		210		3	100		100		0
28	8,131	8	20		15	71	68	500		350		3	1,500		70		3	100		100		0
29	6,005	8	26		15	72	72	1,600		850		4	1,000		100		3	550		0		0
30	7,458	8	90		15	76	70	2,700		500		2	1,000		300		4	550		50		0
Mean	8,086	10	37		18	77	73	3,373		527		4.4	3,823		337		7.5	1,120		73		0.07

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923–24—Continued

EVANSVILLE (IND.) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Dec., 1923	*1,000 gallons*	*° C.*																				
1	6,984	8	160	------	35	62	62	4,400	------	1,000	------	4	2,000	------	370	------	5	5,050	------	100	------	0
2	5,718	8	120	------	15	60	49	7,200	------	1,600	------	2	2,100	------	180	------	3	5,500	------	100	------	0
3	8,015	8	90	------	20	60	58	4,000	------	700	------	4	1,000	------	250	------	10	5,500	------	100	------	0
4	7,654	8	90	------	18	58	54	3,000	------	1,400	------	4	1,000	------	170	------	10	550	------	50	------	0
5	7,777	8	100	------	20	54	52	3,300	------	400	------	4	1,400	------	180	------	4	100	------	50	------	0
6	7,795	8	150	------	24	52	52	1,800	------	400	------	3	1,400	------	200	------	5	1,000	------	100	------	0
7	7,834	8	150	------	20	49	42	1,700	------	600	------	5	1,500	------	200	------	2	100	------	50	------	0
8	7,379	8	175	------	20	50	48	3,300	------	550	------	3	7,000	------	350	------	1	100	------	50	------	0
9	6,573	8	265	------	20	51	48	3,000	------	350	------	2	9,000	------	190	------	3	5,500	------	100	------	0
10	8,323	8	435	------	20	44	42	2,500	------	100	------	2	7,500	------	150	------	6	1,000	------	0	------	0
11	7,726	8	1,000	------	26	47	43	7,500	------	300	------	3	5,000	------	200	------	3	10,000	------	50	------	0
12	7,664	8	1,000	------	25	48	44	18,000	------	2,000	------	2	8,500	------	200	------	4	10,000	------	100	------	0
13	7,591	8	1,250	------	25	48	36	13,300	------	300	------	1	9,300	------	230	------	2	1,000	------	50	------	0
14	7,706	8	950	------	20	45	35	8,000	------	250	------	3	9,800	------	100	------	2	1,000	------	100	------	0
15	7,132	8	600	------	25	46	30	3,200	------	100	------	5	5,300	------	275	------	6	5,500	------	50	------	0
16	5,731	8	600	------	20	45	35	3,200	------	250	------	3	2,500	------	150	------	6	1,000	------	100	------	0
17	8,719	8	560	------	20	28	26	4,300	------	120	------	2	4,100	------	230	------	12	10,000	------	0	------	0
18	8,787	8	630	------	20	50	46	3,600	------	200	------	2	2,500	------	240	------	2	5,500	------	50	------	0
19	8,183	8	430	------	20	50	46	6,500	------	300	------	2	3,000	------	150	------	6	5,500	------	50	------	0
20	8,066	8	340	------	20	46	32	5,000	------	500	------	2	10,000	------	80	------	3	550	------	50	------	0
21	8,048	8	300	------	20	44	44	5,000	------	375	------	3	7,000	------	50	------	3	5,500	------	50	------	0
22	7,492	8	280	------	25	42	47	8,000	------	900	------	3	2,000	------	275	------	8	5,500	------	50	------	0
23	6,626	8	320	------	20	38	30	5,000	------	250	------	4	3,800	------	200	------	4	5,500	------	100	------	0
24	7,559	8	320	------	20	46	46	6,000	------	220	------	3	3,600	------	140	------	5	5,500	------	50	------	0
25	6,368	8	420	------	25	50	46	4,500	------	650	------	2	6,500	------	300	------	5	5,500	------	50	------	0
26	7,058	8	600	------	25	58	46	6,400	------	300	------	3	10,000	------	80	------	4	1,000	------	100	------	0
27	6,803	8	750	------	25	67	63	7,500	------	650	------	2	15,000	------	160	------	3	10,000	------	50	------	0
28	7,441	9	700	------	20	68	66	4,500	------	180	------	4	12,000	------	160	------	3	5,500	------	100	------	0
29	6,734	8	480	------	20	62	62	4,000	------	270	------	2	5,000	------	200	------	4	550	------	50	------	0

30	5,695	8	400	------	20	52	38	2,500	--------	200	--------	4	2,500	-------	150	-------	5	100	-------	0	-------	0
31	7,062	8	480	------	20	48	42	1,500	--------	200	--------	6	5,000	-------	80	-------	4	1,000	-------	50	-------	0
Mean	7,363	8	456	------	21	51	46	5,216	--------	503	--------	3	5,045	-------	190	-------	5	3,880	-------	63	-------	0
Jan., 1924																						
1	6,342	8	380	------	25	47	46	5,000	--------	800	--------	3	3,500	-------	120	-------	4	10,000	-------	50	-------	0
2	7,920	8	280	------	25	47	47	6,000	--------	650	--------	3	2,000	-------	200	-------	3	1,000	-------	50	-------	0
3	7,889	7	320	------	20	42	40	5,000	--------	100	--------	3	3,500	-------	180	-------	3	5,500	-------	50	-------	0
4	7,920	7	645	------	25	46	43	4,800	--------	275	--------	4	4,500	-------	250	-------	5	1,000	-------	0	-------	0
5	8,240	6	600	------	40	43	33	45,000	--------	400	--------	4	4,000	-------	250	-------	4	5,500	-------	100	-------	0
6	8,063	4	510	------	37	38	32	5,000	--------	1,200	--------	6	3,000	-------	350	-------	3	5,500	-------	100	-------	0
7	9,298	4	540	------	25	36	34	6,000	--------	200	--------	2	3,500	-------	400	-------	4	10,000	-------	100	-------	0
8	9,160	4	440	------	25	36	32	5,000	--------	150	--------	2	3,000	-------	200	-------	4	1,000	-------	50	-------	0
9	8,274	4	300	------	[illegible]	31	28	4,000	--------	150	--------	3	2,300	-------	100	-------	4	1,000	-------	50	-------	0
10	7,997	4	240	------	[illegible]	26	22	3,000	--------	600	--------	5	2,100	-------	150	-------	4	5,500	-------	50	-------	0
11	8,215	4	200	------	25	26	33	2,800	--------	400	--------	4	2,300	-------	180	-------	4	5,500	-------	100	-------	0
12	7,970	3	190	------	22	28	29	3,700	--------	500	--------	2	2,200	-------	250	-------	5	5,500	-------	50	-------	0
13	6,684	2	140	------	22	29	28	4,500	--------	500	--------	2	2,000	-------	230	-------	3	1,000	-------	50	-------	0
14	8,129	2	140	------	30	35	39	4,000	--------	1,000	--------	3	2,200	-------	325	-------	5	5,500	-------	100	-------	0
15	8,336	2	380	------	27	43	42	10,000	--------	1,200	--------	4	2,500	-------	300	-------	14	10,000	-------	50	-------	0
16	8,052	2	400	------	27	46	43	12,600	--------	2,900	--------	2	3,000	-------	275	-------	25	1,000	-------	0	-------	0
17	7,959	2	360	------	40	47	43	13,000	--------	2,500	--------	4	12,000	-------	500	-------	9	1,000	-------	50	-------	0
18	8,119	2	510	------	30	41	44	20,000	--------	3,000	--------	5	3,000	-------	300	-------	12	1,000	-------	100	-------	0
19	7,581	2	410	------	25	39	34	10,000	--------	1,200	--------	3	3,000	-------	275	-------	18	550	-------	0	-------	0
20	6,892	2	360	------	26	43	42	5,800	--------	1,600	--------	4	3,500	-------	250	-------	30	5,500	-------	100	-------	0
21	9,091	2	390	------	25	44	57	22,500	--------	3,500	--------	4	3,000	-------	300	-------	26	5,500	-------	50	-------	0
22	8,810	2	280	------	25	38	33	11,500	--------	1,600	--------	2	3,000	-------	250	-------	36	1,000	-------	50	-------	0
23	8,413	2	210	------	22	40	40	9,000	--------	1,800	--------	1	2,800	-------	180	-------	8	5,500	-------	50	-------	0
24	8,067	2	300	------	25	34	28	4,300	--------	1,200	--------	2	950	-------	175	-------	1	1,000	-------	50	-------	0
25	8,213	2	280	------	25	36	30	9,000	--------	1,400	--------	4	2,300	-------	160	-------	3	100	-------	100	-------	0
26	8,141	2	250	------	25	36	28	25,500	--------	3,110	--------	1	3,250	-------	235	-------	3	1,000	-------	100	-------	0
27	6,893	2	230	------	20	37	27	46,000	--------	200	--------	2	1,420	-------	210	-------	4	1,000	-------	0	-------	0
28	8,560	2	200	------	20	38	38	22,000	--------	2,840	--------	1	650	-------	225	-------	5	1,000	-------	100	-------	0
29	8,439	2	220	------	25	42	40	25,000	--------	10,000	--------	1	1,650	-------	350	-------	2	1,000	-------	100	-------	0
30	8,357	2	270	------	25	47	45	45,000	--------	400	--------	1	1,550	-------	450	-------	4	550	-------	100	-------	0
31	8,269	2	280	------	20	50	47	50,000	--------	400	--------	2	2,500	-------	300	-------	2	5,500	-------	50	-------	0
Mean	8,074	3	332	------	26	39	37	11,077	--------	1,737	--------	3	2,909	-------	255	-------	8	3,410	-------	63	-------	0
Feb., 1924																						
1	7,779	2	280	------	22	52	45	30,000	--------	3,200	--------	1	2,000	-------	180	-------	1	1,000	-------	100	-------	0
2	7,189	2	200	------	20	51	64	60,000	--------	4,000	--------	2	1,500	-------	60	-------	2	5,500	-------	50	-------	0
3	5,990	2	130	------	20	55	51	65,000	--------	5,000	--------	1	1,400	-------	40	-------	1	10,000	-------	100	-------	0
4	7,943	2	150	------	20	59	52	80,000	--------	6,000	--------	2	3,700	-------	250	-------	2	10,000	-------	100	-------	0
5	7,880	2	220	------	20	62	59	120,000	--------	7,000	--------	2	4,000	-------	500	-------	2	5,500	-------	100	-------	0
6	8,220	2	450	------	55	63	55	300,000	--------	9,000	--------	2	100,000	-------	100	-------	2	5,500	-------	100	-------	0
7	8,224	2	260	------	22	64	47	60,000	--------	3,000	--------	3	1,300	-------	640	-------	4	1,000	-------	100	-------	0
8	8,069	2	165	------	20	62	52	50,000	--------	2,700	--------	1	1,200	-------	300	-------	1	550	-------	0	-------	0
9	7,417	2	160	------	18	67	65	30,000	--------	2,000	--------	1	1,500	-------	250	-------	1	5,500	-------	100	-------	0
10	6,256	2	200	------	15	71	61	35,000	--------	2,300	--------	1	1,000	-------	200	-------	4	550	-------	50	-------	0

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923–24—Continued

EVANSVILLE (IND.) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Feb., 1924	*1,000 gallons*	*° C.*																				
11	8,255	3	300	......	20	72	70	81,000	......	3,400	......	1	2,500	......	400	......	4	1,000	......	100	......	0
12	7,974	3	280	......	27	71	69	25,000	......	3,000	......	1	7,000	......	450	......	2	550	......	100	......	2
13	7,942	3	140	......	20	64	60	30,000	......	3,000	......	1	1,500	......	160	......	2	1,000	......	100	......	0
14	7,630	3	125	......	20	57	50	32,000	......	4,000	......	1	1,000	......	200	......	1	1,000	......	100	......	0
15	7,639	4	140	......	20	53	52	27,000	......	2,500	......	2	850	......	230	......	1	1,000	......	100	......	0
16	7,074	4	170	......	15	48	39	50,000	......	4,000	......	1	1,000	......	170	......	2	550	......	100	......	0
17	6,005	3	160	......	15	44	44	32,000	......	3,000	......	2	600	......	100	......	1	1,000	......	100	......	0
18	7,926	3	200	......	25	51	48	12,000	......	3,000	......	3	1,000	......	100	......	2	550	......	50	......	0
19	7,742	3	260	......	25	41	39	37,000	......	3,100	......	2	1,600	......	250	......	2	1,000	......	100	......	0
20	7,878	2	280	......	22	42	41	80,000	......	5,000	......	2	3,400	......	200	......	0	5,500	......	100	......	0
21	8,165	2	280	......	27	45	35	67,000	......	5,000	......	5	1,000	......	200	......	4	550	......	100	......	0
22	7,625	2	170	......	25	40	42	37,000	......	4,000	......	3	1,200	......	200	......	2	5,050	......	50	......	0
23	8,276	3	240	......	25	56	55	75,000	......	5,000	......	4	3,000	......	300	......	0	1,000	......	100	......	0
24	7,605	3	510	......	25	68	64	169,000	......	10,000	......	2	3,600	......	140	......	2	1,000	......	100	......	0
25	9,052	3	1,000	......	25	65	50	116,000	......	liq.	......	2	12,000	......	400	......	2	1,000	......	50	......	0
26	8,881	4	680	......	25	46	38	62,000	......	3,000	......	1	5,000	......	180	......	1	5,500	......	50	......	0
27	8,449	4	480	......	27	35	25	30,000	......	850	......	1	2,700	......	250	......	2	5,500	......	100	......	0
28	8,507	4	390	......	27	32	42	32,000	......	160	......	2	2,100	......	140	......	3	1,000	......	100	......	0
29	8,553	4	420	......	28	37	22	28,000	......	1,700	......	1	1,200	......	140	......	2	1,000	......	50	......	0
Mean	7,801	3	291	......	23	64	50	65,586	......	3,721	......	1.6	5,822	......	232	......	1.8	2,750	......	84	......	0.07
Mar., 1924																						
1	7,444	4	320	......	22	38	30	25,000	......	1,800	......	1	2,000	......	180	......	1	1,000	......	0	......	0
2	6,484	4	220	......	25	39	57	38,000	......	1,000	......	1	1,000	......	50	......	1	5,050	......	50	......	0
3	8,288	4	160	......	25	38	35	50,000	......	6,000	......	1	1,200	......	100	......	1	550	......	100	......	0
4	7,682	4	180	......	20	38	38	25,000	......	8,400	......	1	9,000	......	130	......	2	1,000	......	50	......	0
5	7,805	4	190	......	22	42	40	17,000	......	4,000	......	2	4,000	......	360	......	1	5,050	......	50	......	0
6	7,887	4	280	......	20	45	38	19,000	......	4,000	......	1	1,600	......	1,200	......	0	550	......	50	......	0
7	8,881	5	280	......	18	48	40	12,000	......	1,800	......	2	1,400	......	80	......	1	550	......	100	......	0
8	7,158	5	200	......	25	55	51	38,000	......	1,800	......	1	2,700	......	110	......	6	10,000	......	100	......	0
9	5,922	5	470	......	25	55	48	15,000	......	5,000	......	1	1,900	......	1,000	......	0	1,000	......	100	......	0
10	8,000	5	1,600	......	25	68	53	130,000	......	12,000	......	1	8,900	......	200	......	1	5,500	......	100	......	0

11......	8,447	5	2,200	......	120	70	42	150,000	......	15,000	......	5	9,000	......	850	......	2	5,500	......	100	......	0
12......	8,415	5	780	......	100	60	52	60,000	......	7,000	......	1	10,000	......	900	......	0	5,500	......	100	......	0
13......	7,729	5	540	......	25	52	50	40,000	......	1,900	......	1	2,600	......	200	......	1	1,000	......	0	......	0
14......	7,742	5	270	......	15	46	36	40,000	......	6,000	......	0	2,000	......	1,000	......	1	1,000	......	0	......	0
15......	7,177	5	380	......	15	40	44	33,000	......	18,000	......	2	2,500	......	1,000	......	0	100	......	50	......	0
16......	6,040	5	290	......	18	42	42	21,000	......	2,000	......	2	1,800	......	600	......	1	1,000	......	100	......	0
17......	8,126	5	250	......	18	43	38	38,000	......	3,000	......	1	2,000	......	170	......	2	5,050	......	100	......	0
18......	7,853	5	180	......	18	42	42	19,000	......	2,300	......	1	2,400	......	650	......	1	550	......	100	......	0
19......	7,724	5	180	......	15	45	52	32,000	......	2,000	......	1	4.000	......	600	......	1	10,000	......	100	......	0
20......	7,552	5	170	......	15	46	41	35,000	......	1,800	......	1	9,000	......	750	......	1	5,500	......	100	......	0
21......	7,526	6	200	......	15	50	48	40,000	......	5,000	......	5	10,000	......	670	......	1	5,500	......	50	......	0
22......	7,100	6	140	......	18	49	48	38,000	......	13,700	......	3	1,000	......	150	......	0	5,500	......	50	......	0
23......	5,793	6	100	......	15	55	48	15,000	......	2,000	......	6	2,700	......	180	......	1	550	......	100	......	0
24......	8,542	6	95	......	15	52	52	25,000	......	1,700	......	2	2,800	......	200	......	1	1,000	......	100	......	0
25......	8,006	6	110	......	15	55	54	36,000	......	3,000	......	8	2,700	......	350	......	2	1,000	......	50	......	0
26......	7,796	6	280	......	25	62	60	50,000	......	4,000	......	4	6,500	......	480	......	2	10,000	......	100	......	0
27......	7,882	6	250	......	25	68	60	35,000	......	3,000	......	2	5,000	......	260	......	1	1,000	......	100	......	0
28......	7,833	7	140	......	20	61	62	25,000	......	1,500	......	2	3,000	......	350	......	2	5,500	......	100	......	0
29......	7,518	8	380	......	25	57	48	24,000	......	1,800	......	9	6,600	......	400	......	3	1,000	......	100	......	0
30......	6,143	8	440	......	25	53	43	40,000	......	1,800	......	13	11,100	......	500	......	1	1,000	......	100	......	0
31......	8,150	8	250	......	25	50	45	22,000	......	5,000	......	8	4,500	......	330	......	2	5,500	......	50	......	0
Mean	7,569	7	372	......	26	50	46	38,290	......	4,729	......	3	4,358	......	451	......	1.2	3,320	......	76	......	0
April, 1924																						
1......	7,672	8	300	......	25	56	50	28,000	......	3,000	......	2	10,000	......	700	......	15	10,000	......	100	......	0
2......	7,907	8	1,750	......	26	60	54	87,000	......	5,000	......	15	18,900	......	1,200	......	10	10,000	......	100	......	0
3......	7,850	9	900	......	95	58	62	65,000	......	15,000	......	18	14,100	......	2,400	......	16	1,000	......	100	......	0
4......	7,413	9	540	......	30	52	57	50,000	......	3,000	......	5	5,000	......	910	......	5	10,000	......	100	......	0
5......	7,193	10	1,000	......	45	40	42	70,000	......	5,000	......	6	5,000	......	550	......	20	1,000	......	100	......	0
6......	5,784	10	840	......	75	38	30	35,000	......	3,000	......	5	9,200	......	700	......	8	1,000	......	100	......	0
7......	8,326	10	625	......	55	35	9	75,000	......	5,000	......	3	3,000	......	500	......	4	10,000	......	100	......	0
8......	8,251	10	450	......	28	30	10	73,000	......	2,000	......	4	15,000	......	570	......	4	1,000	......	......	......	0
9......	7,887	10	360	......	28	36	28	63,000	......	2,000	......	3	45,000	......	300	......	5	1,000	......	100	......	0
10......	6,664	10	270	......	20	38	38	70,000	......	6,000	......	5	42,000	......	420	......	7	10,000	......	100	......	0
11......	7,417	10	250	......	25	44	38	60,000	......	1,400	......	15	40,000	......	350	......	18	10,000	......	100	......	0
12......	7,348	10	165	......	25	47	45	30,000	......	1,600	......	10	4,000	......	450	......	20	1,000	......	100	......	0
13......	5,978	11	190	......	27	48	41	15,000	......	1,300	......	8	2,700	......	320	......	16	1,000	......	100	......	0
14......	8,131	12	170	......	20	48	40	8,000	......	1,000	......	1	3,200	......	350	......	3	1,000	......	100	......	0
15......	8,728	12	150	......	25	48	46	15,000	......	850	......	3	2,700	......	150	......	7	1,000	......	100	......	0
16......	8,075	12	100	......	25	43	45	5,500	......	1,000	......	3	2,200	......	320	......	4	1,000	......	100	......	0
17......	7,760	13	90	......	18	42	44	4,000	......	400	......	2	1,500	......	120	......	2	1,000	......	......	......	0
18......	6,599	13	95	......	15	42	37	6,000	......	180	......	0	1,500	......	70	......	4	1,000	......	100	......	0
19......	6,644	14	90	......	15	37	45	6,000	......	400	......	3	1,000	......	100	......	5	1,000	......	100	......	0
20......	5,094	14	150	......	15	41	37	6,000	......	800	......	3	2,500	......	250	......	2	1,000	......	......	......	0
21......	7,794	14	300	......	15	42	42	1,200	......	450	......	2	1,500	......	90	......	2	1,000	......	......	......	0
22......	7,806	14	165	......	15	45	45	5,000	......	250	......	2	1,800	......	120	......	6	1,000	......	100	......	0
23......	7,900	14	110	......	15	40	49	8,100	......	390	......	2	3,000	......	160	......	3	1,000	......	100	......	0
24......	8,126	14	90	......	15	51	45	13,000	......	550	......	2	2,300	......	280	......	3	1,000	......	100	......	0
25......	3,174	14	110	......	15	53	60	7,000	......	450	......	2	1,400	......	150	......	5	100	......	100	......	0
26......	7,951	14	110	......	15	58	58	2,000	......	340	......	2	1,200	......	70	......	3	1,000	......	100	......	0
27......	3,382	15	160	......	15	58	56	8,000	......	170	......	3	3,200	......	200	......	2	10,000	......	......	......	0

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923-24—Continued

EVANSVILLE (IND.) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
April, 1924	*1,000 gallons*	° *C.*																				
28	7, 908	16	140	......	15	53	62	4, 000	......	300	......	2	1, 000	......	850	......	2	1, 000	......	100	......	0
29	7, 155	16	240	......	15	53	46	14, 000	......	1, 000	......	2	1, 500	......	140	......	0	10, 000	......	......	......	0
30	7, 182	16	250	......	15	52	44	13, 000	......	700	......	1	5, 700	......	180	......	1	1, 000	......	100	......	0
Mean	7, 437	12	339	......	26	46	44	28, 586	......	3, 674	......	5	11, 130	......	432	......	7	3, 400	......	100	......	0
May, 1924																						
1	7, 228	16	280	......	25	52	48	10, 000	......	850	......	0	4, 000	......	230	......	1	1, 000	......	100	......	0
2	8, 067	16	360	......	20	58	58	14, 000	......	1, 100	......	2	4, 500	......	200	......	1	1, 000	......	100	......	0
3	6, 238	16	200	......	23	58	61	12, 000	......	540	......	4	3, 600	......	270	......	2	10, 000	......	100	......	0
4	5, 471	16	160	......	25	61	56	9, 000	......	630	......	7	2, 000	......	150	......	3	1, 000	......	100	......	0
5	8, 141	16	140	......	25	56	58	6, 000	......	320	......	3	1, 400	......	180	......	2	10, 000	......	100	......	0
6	8, 135	16	200	......	25	67	66	6, 500	......	1, 200	......	12	2, 500	......	300	......	3	10, 000	......	100	......	0
7	7, 941	16	180	......	25	67	69	8, 000	......	3, 000	......	3	1, 200	......	200	......	3	1, 000	......	100	......	0
8	8, 068	16	160	......	25	65	69	8, 000	......	1, 400	......	2	1, 300	......	470	......	4	1, 000	......	100	......	0
9	7, 785	16	200	......	25	60	61	5, 000	......	600	......	1	1, 800	......	200	......	5	1, 000	......	100	......	0
10	7, 361	16	200	......	25	50	52	7, 000	......	800	......	2	1, 600	......	400	......	4	1, 000	......	100	......	0
11	6, 051	16	170	......	25	50	48	15, 000	......	800	......	10	2, 600	......	360	......	4	1, 000	......	100	......	0
12	8, 422	16	220	......	25	50	54	8, 000	......	850	......	2	2, 500	......	500	......	1	10, 000	......	100	......	0
13	6, 854	16	280	......	25	50	51	28, 000	......	900	......	5	8, 100	......	3, 000	......	3	1, 000	......	100	......	0
14	7, 697	16	190	......	20	50	51	7, 000	......	750	......	1	8, 000	......	600	......	3	1, 000	......	100	......	0
15	7, 685	16	190	......	25	49	51	14, 000	......	620	......	3	3, 400	......	200	......	1	10, 000	......	100	......	0
16	7, 761	16	170	......	25	57	54	13, 000	......	400	......	10	3, 800	......	500	......	4	10, 000	......	100	......	0
17	7, 459	16	170	......	25	55	65	8, 000	......	600	......	1	4, 600	......	250	......	2	1, 000	......	100	......	0
18	6, 290	16	190	......	20	46	46	14, 000	......	740	......	6	5, 800	......	500	......	1	1, 000	......	100	......	0
19	7, 848	16	320	......	25	30	33	42, 000	......	2, 300	......	2	5, 400	......	200	......	6	10, 000	......	100	......	0
20	7, 355	16	360	......	25	28	18	50, 000	......	2, 300	......	8	8, 000	......	400	......	6	10, 000	......	100	......	0
21	7, 504	16	220	......	18	27	14	7, 000	......	370	......	2	2, 500	......	120	......	2	10, 000	......	100	......	0
22	7, 479	16	210	......	15	28	18	6, 000	......	220	......	3	2, 800	......	150	......	4	1, 000	......	100	......	0
23	7, 372	16	140	......	15	36	40	10, 000	......	100	......	5	2, 600	......	160	......	2	10, 000	......	100	......	0
24	6, 767	16	140	......	15	35	27	8, 000	......	450	......	0	3, 000	......	170	......	2	1, 000	......	100	......	0

25	5,752	16	140	......	15	40	27	18,000	......	400	......	3	4,500	......	240	......	9	1,000	......	100	......	0
26	7,749	16	130	......	15	45	37	12,000	......	900	......	4	2,200	......	400	......	4	1,000	......	100	......	0
27	7,774	16	130	......	15	45	40	15,000	......	9,400	......	2	4,500	......	400	......	2	10,000	......	100	......	0
28	7,721	16	130	......	15	45	40	7,000	......	800	......	2	3,000	......	500	......	2	10,000	......	100	......	0
29	7,760	17	120	......	15	40	40	4,000	......	500	......	3	3,500	......	450	......	2	1,000	......	100	......	0
30	6,460	17	145	......	15	45	45	9,000	......	380	......	2	5,400	......	300	......	4	10,000	......	100	......	0
31	6,904	17	140	......	15	46	45	6,600	......	400	......	2	2,500	......	230	......	1	10,000	......	100	......	0
Mean	7,326	16	193	......	21	48	46	12,455	......	1,114	......	4	3,600	......	306	......	3	5,060	......	100	......	0
June, 1924																						
1	5,704	17	130	......	15	48	50	12,000	......	380	......	2	15,000	......	520	......	4	1,000	......	100	......	0
2	7,862	18	135	......	15	52	57	18,000	......	700	......	3	10,000	......	500	......	1	1,000	......	100	......	0
3	7,466	18	100	......	15	56	54	6,500	......	270	......	4	3,500	......	300	......	1	1,000	......	100	......	0
4	7,674	18	105	......	15	50	57	5,000	......	300	......	3	2,500	......	480	......	2	10,000	......	100	......	0
5	7,908	19	130	......	15	59	59	8,000	......	600	......	3	2,400	......	250	......	1	10,000	......	100	......	0
6	7,680	20	165	......	15	46	44	11,000	......	1,000	......	1	3,600	......	250	......	3	1,000	......	100	......	0
7	6,721	20	280	......	15	45	42	16,000	......	320	......	3	2,700	......	150	......	1	10,000	......	100	......	0
8	5,356	20	300	......	15	48	43	47.000	......	140	......	2	3,600	......	120	......	4	1,000	......	100	......	0
9	7,549	20	340	......	20	50	45	42,000	......	9,000	......	2	11,600	......	240	......	2	10,000	......	100	......	0
10	7,412	20	270	......	15	47	51	24,000	......	500	......	6	4,500	......	350	......	3	1,000	......	100	......	0
11	7,292	21	270	......	20	54	54	29,000	......	600	......	8	2.500	......	300	......	3	10,000	......	100	......	0
12	7,430	21	190	......	15	60	52	25,000	......	400	......	1	3,500	......	270	......	4	10,000	......	100	......	0
13	6,977	22	340	......	25	62	67	24,000	......	1,400	......	12	6,600	......	500	......	12	10,000	......	100	......	0
14	6,754	22	300	......	25	70	67	12.000	......	700	......	5	4,300	......	370	......	3	10,000	......	100	......	0
15	5,536	22	840	......	25	78	73	26,000	......	11,000	......	10	12,000	......	7,000	......	10	10,000	......	100	......	0
16	7,664	22	900	......	25	78	62	25,000	......	200	......	5	10,000	......	400	......	11	1,000	......	100	......	0
17	7,952	22	680	......	25	62	55	18,000	......	470	......	3	8,700	......	270	......	2	10,000	......	100	......	0
18	7,376	23	560	......	25	58	48	12,000	......	190	......	3	9,000	......	380	......	3	10,000	......	100	......	0
19	7,834	23	580	......	25	50	65	10,000	......	200	......	1	6,700	......	300	......	6	1,000	......	100	......	0
20	7,947	24	400	......	22	60	58	8,000	......	200	......	2	3,000	......	240	......	20	10,000	......	100	......	0
21	7,169	24	375	......	70	63	60	6,000	......	700	......	1	3,900	......	900	......	2	10,000	......	100	......	0
22	5,010	24	420	......	20	62	64	12,000	......	220	......	2	5,000	......	260	......	20	10,000	......	100	......	0
23	7,450	24	390	......	25	64	54	10,000	......	580	......	4	8,000	......	650	......	9	1,000	......	100	......	0
24	7,610	24	380	......	25	66	68	15,000	......	550	......	4	5,000	......	550	......	2	10,000	......	100	......	0
25	7,660	25	300	......	25	65	55	18,000	......	1,600	......	10	4,000	......	120	......	10	10,000	......	100	......	0
26	7,828	26	240	......	47	68	56	16,000	......	1,250	......	4	6,000	......	2,200	......	16	10,000	......	100	......	0
27	7,790	26	260	......	30	74	70	10,000	......	700	......	6	4,800	......	1,600	......	6	10,000	......	100	......	0
28	6,898	26	300	......	20	74	74	12.000	......	600	......	5	5,000	......	900	......	9	1,000	......	100	......	0
29	5,784	26	190	......	15	75	70	10,000	......	200	......	3	6,500	......	500	......	45	1,000	......	100	......	0
30	7,736	26	190	......	18	83	83	7.000	......	160	......	1	6,500	......	470	......	3	10,000	......	100	......	0
Mean	7,168	22	211	......	23	60	59	16,483	......	967	......	4	7,790	......	698	......	7	6,700	......	100	......	0

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923-24—Continued

HENDERSON (KY.) WATER FILTRATION PLANT

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
July, 1923	*1,000 gallons*	*° C.*																				
1	2, 105		85	10		56	47															
2	2, 075		90	10		53	45						5, 000			60	5	1, 000			10	0
3	2, 090		80	10		56	47															
4	2, 070		80	10		61	52						3, 000				4	1, 000				0
5	2, 105		80	10		70	59															
6	2, 360		80	10		67	56										0					0
7	2, 350		75	10		62	54															
8	2, 340		70	10		61	56															
9	2, 320		75	10		60	54						16, 000				10	10, 000				0
10	2, 400		145	15		65	56										2					0
11	2, 640		120	10		71	61															
12	2, 780		100	10		64	55										12					0
13	2, 265		250	10		72	63															
14	2, 365		150	10		60	56															
15	2, 330		80	10		64	50															
16	2, 420		75	10		62	51						6, 000			170	3	1, 000			10	0
17	2, 070		70	10		62	53						6, 000				4	10, 000				0
18	2, 235		110	10		61	50										14					0
19	2, 380		171	15		63	54										1					0
20	2, 380		185	10		70	61															
21	2, 280		200	15		70	62										3					0
22	2, 440		140	10		72	63															
23	2, 277		120	10		74	61										15					0
24	2, 193		125	10		68	60															
25	2, 568		100	10		71	62						3, 100				20	1, 000				0
26	2, 230		80	10		65	57															
27	1, 890		75	10		68	56															
28	2, 300		80	10		65	55						5, 000			60	6	1, 000			0	0
29	2, 425		70	10		63	55															
30	2, 180		50	10		65	56										7					0
31	2, 245		45	10		68	56						9, 000			200	3	1, 000			10	0
Mean	2, 310		105	10		65	55						6, 638			123	7	3, 250			7. 5	0

Aug., 1923																					
1	2,421	28	70	10	------	70	59	------	------	------	------	------	9,000	1,500	------	300	3	1,000	100	------	4	0
2	2,230	30	65	10	------	76	60	------	------	------	------	------	30,000	2,000	------	200	2	1,000	100	------	2	0
3	2,810	27	85	10	------	72	63	------	------	------	------	------	3,000	1,250	------	80	2	1,000	1,000	------	4	0
4	1,905	27	100	10	------	60	52	------	------	------	------	------	3,500	2,000	------	300	4	1,000	100	------	4	0
5	2,350	28	110	10	------	62	58	------	------	------	------	------	5,000	3,000	------	350	2	1,000	1,000	------	2	0
6	1,890	30	260	15	------	72	60	------	------	------	------	------	4,000	1,500	------	20	3	10,000	1,000	------	0	0
7	2,600	28	220	10	------	69	58	------	------	------	------	------	30,000	1,300	------	6	3	1,000	10	------	0	0
8	2,585	26	230	10	------	72	61	------	------	------	------	------	20,000	800	------	21	5	1,000	1,000	------	0	0
9	2,360	28	200	15	------	67	58	------	------	------	------	------	4,500	400	------	15	5	1,000	10	------	4	0
10	2,600	28	260	10	------	63	55	------	------	------	------	------	4,000	500	------	5	2	1,000	100	------	6	0
11	2,441	28	200	10	------	55	46	------	------	------	------	------	12,000	3,000	------	150	20	10,000	100	------	4	0
12	2,344	28	180	10	------	54	46	------	------	------	------	------	10,000	3,500	------	100	10	1,000	100	------	2	0
13	2,540	27	220	10	------	59	46	------	------	------	------	------	3,000	1,000	------	20	4	1,000	1,000	------	0	0
14	2,615	29	260	10	------	61	46	------	------	------	------	------	2,000	1,200	------	20	3	100	100	------	8	0
15	2,585	28	240	10	------	59	44	------	------	------	------	------	5,000	1,400	------	25	6	1,000	10,000	------	4	0
16	2,975	28	240	10	------	54	45	------	------	------	------	------	4,000	500	------	30	2	1,000	1,000	------	8	0
17	2,445	28	220	15	------	52	46	------	------	------	------	------	12,000	2,000	------	20	3	1,000	100	------	8	4
18	2,460	28	290	15	------	55	47	------	------	------	------	------	30,000	3,100	------	150	35	1,000	100	------	6	2
19	2,200	28	360	20	------	50	44	------	------	------	------	------	40,000	2,500	------	100	20	1,000	1,000	------	4	0
20	2,255	27	420	15	------	58	40	------	------	------	------	------	15,000	1,900	------	14	7	10,000	100	------	10	2
21	2,425	27	300	15	------	58	41	------	------	------	------	------	12,000	2,100	------	30	8	10,000	100	------	6	0
22	2,440	27	350	15	------	52	42	------	------	------	------	------	8,000	600	------	20	6	1,000	100	------	6	0
23	2,130	27	310	10	------	50	40	------	------	------	------	------	6,000	700	------	5	4	1,000	100	------	8	0
24	2,285	27	240	100	------	50	41	------	------	------	------	------	4,000	400	------	7	1	1,000	100	------	2	0
25	2,060	26	220	10	------	50	42	------	------	------	------	------	7,000	2,000	------	8	5	100	100	------	4	0
26	2,345	27	170	15	------	48	40	------	------	------	------	------	5,000	1,500	------	15	1	100	10	------	2	0
27	2,136	27	170	15	------	50	41	------	------	------	------	------	3,000	700	------	3	3	100	10	------	2	0
28	2,539	28	150	10	------	52	40	------	------	------	------	------	1,500	300	------	5	2	100	100	------	4	0
20	2,575	27	120	10	------	49	38	------	------	------	------	------	2,000	800	------	6	4	100	100	------	4	0
30	2,580	26	120	10	------	51	40	------	------	------	------	------	1,000	500	------	7	4	1,000	100	------	4	0
31	2,642	27	100	10	------	57	40	------	------	------	------	------	2,500	400	------	10	5	1,000	100	------	2	0
Mean	2,408	27	209	15	------	58	48	------	------	------	------	------	9,613	1,431	------	66	6	1,990	611	------	3.4	0.27
Sept., 1923																					
1	2,668	27	90	10	------	51	40	------	------	------	------	------	15,000	800	------	300	20	1,000	100	------	8	2
2	2,120	28	130	10	------	50	38	------	------	------	------	------	10,000	1,000	------	250	5	10,000	1,000	------	8	4
3	1,815	28	100	15	------	50	41	------	------	------	------	------	12,000	1,500	------	200	10	1,000	1,000	------	4	2
4	3,050	28	100	10	------	60	40	------	------	------	------	------	2,500	500	------	7	2	10,000	1,000	------	8	2
5	1,995	26	130	10	------	67	43	------	------	------	------	------	1,200	700	------	3	2	1,000	1,000	------	6	0
6	2,285	26	110	15	------	70	50	------	------	------	------	------	2,600	1,500	------	50	3	1,000	100	------	2	0
7	2,570	26	110	10	------	73	56	------	------	------	------	------	2,500	800	------	5	3	1,000	1,000	------	4	0
8	2,344	27	130	10	------	75	52	------	------	------	------	------	3,500	900	------	10	4	1,000	100	------	4	0
9	2,045	27	150	10	------	70	55	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
10	2,200	27	150	10	------	72	50	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
11	2,495	27	175	15	------	70	58	------	------	------	------	------	1,200	700	------	5	4	1,000	100	------	8	0
12	2,320	26	160	10	------	74	55	------	------	------	------	------	1,600	900	------	9	6	1,000	10	------	8	0
13	2,350	26	150	10	------	72	50	------	------	------	------	------	900	250	------	10	8	1,000	100	------	4	0
14	2,255	25	165	10	------	65	52	------	------	------	------	------	1,200	400	------	12	5	100	100	------	2	0
15	2,112	25	130	15	------	62	50	------	------	------	------	------	1,600	300	------	10	4	1,000	100	------	4	0

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923-24—Continued

HENDERSON (KY.) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 cubic c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Sept., 1923	*1,000 gallons*	°*C.*																				
16	3,023	24	120	10	------	67	52	------	------	------	------	------	2,500	600	------	10	7	100	100	------	2	0
17	1,105	22	110	10	------	69	57	------	------	------	------	------	2,000	300	------	5	2	10,000	100	------	4	0
18	2,010	22	100	10	------	80	56	------	------	------	------	------	1,800	400	------	6	3	1,000	100	------	4	0
19	2,015	22	100	15	------	81	57	------	------	------	------	------	2,500	600	------	12	4	1,000	1,000	------	8	0
20	2,231	23	80	10	------	80	57	------	------	------	------	------	2,000	900	------	60	5	1,000	100	------	4	0
21	1,888	23	50	10	------	78	58	------	------	------	------	------	3,100	700	------	50	7	1,000	1,000	------	6	0
22	1,830	23	55	10	------	78	59	------	------	------	------	------	4,000	800	------	20	4	1,000	1,000	------	6	0
23	1,845	23	50	10	------	75	60	------	------	------	------	------	2,500	600	------	15	3	1,000	100	------	4	0
24	2,230	23	40	8	------	78	61	------	------	------	------	------	3,600	900	------	12	5	1,000	100	------	6	0
25	2,170	22	35	10	------	80	63	------	------	------	------	------	3,000	500	------	14	4	1,000	1,000	------	8	2
26	2,090	22	30	8	------	81	67	------	------	------	------	------	2,100	700	------	70	5	10,000	10,000	------	6	0
27	2,290	23	35	10	------	81	68	------	------	------	------	------	3,200	650	------	60	4	1,000	1,000	------	6	2
28	2,225	23	30	10	------	76	65	------	------	------	------	------	1,500	400	------	20	6	1,000	1,000	------	8	0
29	2,365	23	30	8	------	78	67	------	------	------	------	------	2,000	350	------	40	4	1,000	1,000	------	8	0
30	2,235	23	30	8	------	71	65	------	------	------	------	------	2,500	470	------	30	5	1,000	100	------	6	0
Mean	2,227	25	96	11	------	71	55	------	------	------	------	------	3,357	685	------	46	5	2,220	840	------	5.6	0.5
Oct., 1923																						
1	2,096	23	35	8	------	75	60	------	------	------	------	------	1,900	1,000	------	300	17	100	100	------	10	2
2	2,095	23	35	10	------	75	60	------	------	------	------	------	2,800	1,600	------	100	20	1,000	100	------	10	2
3	2,060	23	30	10	------	71	61	------	------	------	------	------	3,000	1,500	------	70	12	1,000	1,000	------	8	2
4	1,750	23	25	8	------	71	60	------	------	------	------	------	3,500	500	------	10	8	1,000	100	------	10	2
5	1,935	22	25	8	------	78	64	------	------	------	------	------	3,500	900	------	15	6	1,000	1,000	------	6	0
6	1,765	21	25	8	------	82	65	------	------	------	------	------	2,000	700	------	20	4	1,000	100	------	6	0
7	1,990	20	25	10	------	86	70	------	------	------	------	------	1,500	600	------	12	3	1,000	1,000	------	8	0
8	1,955	19	25	8	------	86	70	------	------	------	------	------	3,000	500	------	10	3	100	100	------	8	0
9	2,390	19	25	8	------	82	70	------	------	------	------	------	3,500	400	------	12	5	1,000	1,000	------	6	6
10	2,080	19	25	8	------	82	70	------	------	------	------	------	10,000	600	------	10	4	1,000	100	------	10	6
11	1,905	19	25	8	------	80	71	------	------	------	------	------	6,000	800	------	20	5	1,000	1,000	------	6	0

12	1,940	19	25	8	......	76	67	......	......	......	......	......	1,000	400	......	2	1	1,000	1,000	......	6	0
13	1,850	19	25	10	......	79	69	......	......	......	......	......	3,000	800	......	6	2	1,000	1,000	......	6	0
14	1,895	18	25	8	......	80	71	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
15	2,185	18	25	10	......	80	68	......	......	......	......	......	1,200	900	......	120	9	1,000	1,000	......	8	0
16	1,936	19	25	10	......	80	70	......	......	......	......	......	2,500	1,000	......	300	4	1,000	1,000	......	10	2
17	1,904	18	35	10	......	72	60	......	......	......	......	......	3,000	700	......	150	5	1,000	1,000	......	4	0
18	1,620	18	80	10	......	72	61	......	......	......	......	......	2,000	600	......	100	6	1,000	100	......	8	0
19	1,885	18	110	10	......	80	62	......	......	......	......	......	3,500	500	......	120	7	1,000	1,000	......	10	2
20	1,835	17	120	10	......	71	60	......	......	......	......	......	1,500	300	......	70	6	1,000	1,000	......	4	0
21	1,825	17	65	10	......	70	60	......	......	......	......	......	2,500	200	......	60	5	1,000	100	......	2	0
22	1,915	15	60	10	......	65	57	......	......	......	......	......	1,000	200	......	4	2	1,000	100	......	4	0
23	1,877	15	50	10	......	67	56	......	......	......	......	......	3,500	300	......	10	6	100	100	......	6	0
24	1,893	14	35	10	......	65	54	......	......	......	......	......	3,000	200	......	8	4	100	100	......	4	0
25	1,920	14	25	8	......	68	55	......	......	......	......	......	2,000	150	......	10	5	1,000	1,000	......	4	0
26	1,596	14	25	10	......	72	56	......	......	......	......	......	2,500	175	......	12	5	1,000	100	......	4	0
27	2,079	14	20	10	......	78	58	......	......	......	......	......	1,500	600	......	15	4	1,000	100	......	6	0
28	1,900	15	25	10	......	80	60	......	......	......	......	......	4,100	1,500	......	17	3	1,000	1,000	......	4	0
29	1,795	16	25	8	......	79	60	......	......	......	......	......	3,400	700	......	18	6	1,000	100	......	6	0
30	1,815	15	20	10	......	78	57	......	......	......	......	......	3,000	500	......	10	8	100	100	......	4	0
31	2,075	15	25	8	......	79	58	......	......	......	......	......	3,600	575	......	14	7	1,000	1,000	......	4	0
Mean	1,928	18	37	9	......	76	63	......	......	......	......	......	2,855	623	......	52	6	850	550	......	6.4	0.8
Nov., 1923																						
1	1,830	16	25	10	......	70	55	......	......	......	......	......	3,000	600	......	60	15	1,000	1,000	......	4	2
2	2,165	15	30	10	......	75	60	......	......	......	......	......	3,800	900	......	50	10	1,000	100	......	6	2
3	1,775	15	35	10	......	75	65	......	......	......	......	......	3,500	1,000	......	100	5	1,000	100	......	8	2
4	1,700	14	50	8	......	75	55	......	......	......	......	......	4,000	450	......	110	4	1,000	1,000	......	6	0
5	1,820	14	60	8	......	70	60	......	......	......	......	......	2,500	500	......	50	6	1,000	1,000	......	8	2
6	1,735	14	40	8	......	70	60	......	......	......	......	......	2,000	800	......	35	8	1,000	100	......	6	0
7	1,975	12	30	10	......	65	50	......	......	......	......	......	2,800	1,000	......	40	7	1,000	100	......	8	0
8	1,840	12	65	10	......	60	50	......	......	......	......	......	3,000	475	......	10	3	1,000	1,000	......	4	0
9	1,960	11	20	10	......	60	50	......	......	......	......	......	3,800	580	......	15	7	1,000	1,000	......	8	2
10	1,550	10	60	8	......	65	48	......	......	......	......	......	4,000	900	......	10	5	1,000	1,000	......	4	0
11	2,065	10	60	8	......	60	52	......	......	......	......	......	2,500	700	......	10	5	10,000	1,000	......	4	0
12	1,645	10	65	8	......	65	48	......	......	......	......	......	3,000	850	......	10	5	1,000	1,000	......	4	0
13	90	10	60	10	......	60	49	......	......	......	......	......	2,100	900	......	30	2	1,000	1,000	......	2	0
14	1,095	10	45	10	......	65	52	......	......	......	......	......	3,100	700	......	30	4	1,000	1,000	......	4	2
15	1,890	9	35	8	......	70	58	......	......	......	......	......	2,500	360	......	75	3	1,000	1,000	......	6	2
16	1,820	9	30	8	......	70	61	......	......	......	......	......	1,000	200	......	50	10	1,000	1,000	......	4	0
17	1,610	9	30	10	......	69	51	......	......	......	......	......	2,300	300	......	50	5	1,000	1,000	......	6	0
18	1,540	9	30	10	......	68	56	......	......	......	......	......	2,900	600	......	20	6	1,000	1,000	......	2	0
19	1,765	9	35	10	......	70	60	......	......	......	......	......	3,500	400	......	40	10	1,000	1,000	......	2	0
20	1,805	9	30	10	......	71	59	......	......	......	......	......	2,600	700	......	50	4	1,000	1,000	......	4	0
21	1,785	9	35	10	......	70	61	......	......	......	......	......	4,000	360	......	21	5	1,000	100	......	2	0
22	1,670	9	35	10	......	70	60	......	......	......	......	......	3,600	650	......	35	6	1,000	1,000	......	4	0
23	2,120	9	35	10	......	70	62	......	......	......	......	......	2,800	350	......	25	8	1,000	1,000	......	2	0
24	1,845	9	35	10	......	70	60	......	......	......	......	......	4,500	500	......	20	4	1,000	1,000	......	2	0
25	1,540	9	25	10	......	70	63	......	......	......	......	......	4,100	700	......	30	6	1,000	1,000	......	2	0
26	1,835	8	25	10	......	70	60	......	......	......	......	......	4,700	1,000	......	15	5	1,000	1,000	......	2	0

Summary of daily laboratory results reported from each individual Ohio River plant included in the survey of 1923-24—Continued

HENDERSON (KY.) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (Agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (Agar, 24 hours, 37° C.)					B. coli index per 100 cubic c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Nov. 1923	*1,000 gallons*	*° C.*																				
27	2,805	8	25	8		71	60						3,000	575		21	8	1,000	100		4	0
28	3,000	8	50	8		70	62						5,100	800		20	6	100	100		2	0
29	2,660	8	120	10		71	51						5,700	775		15	4	1,000	1,000		2	0
30	2,260	8	120	10		60	52						4,500	550		10	6	1,000	1,000		2	0
Mean	1,839	10	45	9		68	57						3,330	640		35	6	1,270	790		4.1	0.47
Dec., 1923																						
1	1,755	8	210	10		70	60						3,000	900		30	7	1,000	1,000		2	0
2	1,945	8	220	10		70	58						4,000	600		40	6	1,000	1,000		2	0
3	1,690	7	150	10		60	50						4,500	800		25	4	1,000	1,000		2	0
4	2,125	7	160	10		68	52						4,100	500		30	6	1,000	1,000		2	0
5	2,675	8	150	10		58	50						4,500	900		80	10	1,000	1,000		0	0
6	1,840	8	120	10		58	49						5,000	1,000		60	7	10,000	10,000		2	0
7	2,165	7	320	10		56	45						8,000	600		70	4	10,000	1,000		0	0
8	1,995	7	350	15		56	47						12,000	750		30	5	1,000	1,000		0	0
9	2,042	8	320	15		57	46						9,000	875		40	6	1,000	1,000		0	0
10	2,283	8	500	15		54	45						6,000	1,000		75	8	1,000	1,000		0	0
11	2,050	8	600	20		52	43						7,000	1,200		30	4	1,000	1,000		0	0
12	2,007	8	800	20		54	49						5,000	1,500		50	4	1,000	1,000		2	0
13	2,613	8	800	20		52	43						8,000	1,000		40	6	1,000	100		2	0
14	2,027	9	700	15		46	38						6,000	900		15	3	1,000	10,000		0	0
15	891	9	650	15		45	37						2,500	700		19	4	1,000	100		0	0
16	1,432	8	650	15		47	39						2,000	550		15	7	1,000	100		0	0
17	2,045	9	550	15		49	40						3,100	620		11	4	1,000	100		0	0
18	1,980	8	550	10		53	42						2,600	900		25	6	1,000	100		0	0
19	2,110	8	500	10		52	42						4,100	1,200		15	7	1,000	1,000		2	0
20	1,953	8	420	10		50	41						4,500	1,000		21	6	1,000	1,000		2	0
21	2,075	8	360	10		54	42						2,100	600		14	4	1,000	10,000		4	0

22	2,124	9	270	10	------	55	44	------	------	------	------	------	1,800	400	------	10	4	1,000	100	------	2	0
23	2,698	9	350	10	------	55	46	------	------	------	------	------	2,400	600	------	21	6	1,000	1,000	------	2	0
24	1,745	9	450	15	------	47	40	------	------	------	------	------	3,200	900	------	18	5	1,000	1,000	------	2	0
25	1,710	8	480	15	------	46	39	------	------	------	------	------	4,000	700	------	10	3	1,000	100	------	2	0
26	1,920	8	550	15	------	45	36	------	------	------	------	------	5,100	800	------	6	4	1,000	100	------	0	0
27	2,410	7	650	15	------	48	40	------	------	------	------	------	8,000	700	------	18	10	1,000	1,000	------	2	0
28	1,962	7	550	10	------	59	45	------	------	------	------	------	5,600	1,000	------	30	12	1,000	1,000	------	2	0
29	1,700	7	700	10	------	52	43	------	------	------	------	------	4,000	650	------	20	8	1,000	1,000	------	0	0
30	1,920	8	450	10	------	63	48	------	------	------	------	------	3,200	425	------	15	4	1,000	1,000	------	0	0
31	1,650	7	400	10	------	46	35	------	------	------	------	------	2,900	490	------	10	6	1,000	1,000	------	2	0
Mean	1,985	8	449	13	------	53	44	------	------	------	------	------	4,748	783	------	29	6	1,580	1,640	------	1.2	0
Jan., 1924																						
1	2,145	7	300	15	------	47	35	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
2	2,075	7	250	15	------	49	37	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
3	2,135	7	240	10	------	41	34	------	------	------	------	------	3,800	1,200	------	35	6	1,000	100	------	2	0
4	2,285	8	450	15	------	47	37	------	------	------	------	------	4,500	1,900	------	20	4	1,000	1,000	------	4	0
5	2,635	7	470	15	------	47	38	------	------	------	------	------	8,000	1,400	------	40	5	1,000	1,000	------	2	0
6	2,785	8	400	10	------	45	37	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
7	2,545	7	450	15	------	42	34	------	------	------	------	------	6,200	900	------	28	7	1,000	1,000	------	2	0
8	2,315	7	400	10	------	42	35	------	------	------	------	------	4,500	700	------	30	5	1,000	1,000	------	2	0
9	2,180	7	350	15	------	42	35	------	------	------	------	------	7,100	890	------	19	6	1,000	1,000	------	4	0
10	2,300	6	400	20	------	36	30	------	------	------	------	------	3,700	1,000	------	40	4	1,000	10,000	------	2	0
11	2,197	6	450	25	------	34	27	------	------	------	------	------	2,900	800	------	50	7	1,000	1,000	------	4	0
12	2,064	5	300	20	------	31	24	------	------	------	------	------	3,000	760	------	30	5	1,000	1,000	------	2	0
13	2,066	5	350	25	------	35	25	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
14	2,433	4	300	20	------	37	23	------	------	------	------	------	2,800	800	------	20	10	1,000	1,000	------	6	0
15	2,413	5	350	25	------	38	26	------	------	------	------	------	3,400	1,100	------	40	6	1,000	1,000	------	2	0
16	2,292	5	300	20	------	36	28	------	------	------	------	------	2,500	950	------	20	5	1,000	1,000	------	2	0
17	2,330	5	275	30	------	32	24	------	------	------	------	------	1,900	700	------	15	4	1,000	100	------	2	0
18	2,282	6	250	20	------	38	29	------	------	------	------	------	2,600	1,200	------	20	6	1,000	1,000	------	4	0
19	2,200	5	275	20	------	41	29	------	------	------	------	------	2,100	1,300	------	19	5	1,000	100	------	2	0
20	2,493	6	250	20	------	42	33	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
21	2,675	5	240	25	------	47	31	------	------	------	------	------	2,200	1,000	------	70	6	1,000	1,000	------	2	0
22	2,493	5	250	30	------	37	30	------	------	------	------	------	3,800	1,200	------	300	5	1,000	1,000	------	8	0
23	2,389	5	240	40	------	40	32	------	------	------	------	------	13,300	11,000	------	475	60	1,000	1,000	------	6	2
24	2,313	5	290	30	------	38	30	------	------	------	------	------	41,000	10,000	------	425	17	1,000	100	------	10	6
25	2,472	4	350	30	------	36	27	------	------	------	------	------	6,000	1,300	------	800	37	1,000	100	------	6	0
26	2,850	3	280	25	------	38	29	------	------	------	------	------	12,600	1,900	------	840	12	------	------	------	------	------
27	2,683	3	300	20	------	39	30	------	------	------	------	------	14,500	------	------	960	160	------	------	------	------	------
28	2,600	4	270	20	------	42	31	------	------	------	------	------	4,700	2,100	------	375	85	1,000	100	------	10	2
29	2,408	4	280	25	------	47	36	------	------	------	------	------	2,100	400	------	140	17	1,000	100	------	10	8
30	2,853	4	260	20	------	51	40	------	------	------	------	------	3,600	950	------	125	23	1,000	100	------	4	2
31	2,819	4	250	25	------	52	43	------	------	------	------	------	5,200	1,100	------	300	27	1,000	1,000	------	6	4
Mean	2,410	6	317	21	------	41	32	------	------	------	------	------	6,460	1,780	------	202	21	1,000	1,080	------	4.3	1

APPENDIX B

Summary of daily laboratory results reported from each individual plant, located elsewhere than on the Ohio River, included in the survey of 1923–24

ALBANY (N. Y.) WATER FILTRATION PLANT

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
October, 1923	*1,000 gallons*	° *C*																				
1	20,300	16	1.0	------	1.0	56	34	10,000	---------	3,600	300	3	500	-------	75	30	3	10,000	-------	100	0	0
2	22,600	16	1.0	------	.8	56	34	13,000	---------	1,200	450	5	450	-------	175	60	7	10,000	-------	1,000	10	0
3	24,800	14	1.0	------	.8	52	24	3,400	---------	2,600	500	5	10,500	-------	800	170	4	100,000	-------	1,000	10	0
4	22,400	16	.8	------	.8	54	32	28,000	---------	2,400	475	13	9,900	-------	1,500	250	3	100,000	-------	10,000	10	0
5	23,100	14	.8	------	.8	54	38	17,000	---------	3,000	750	4	4,600	-------	700	100	6	10,000	-------	1,000	10	0
6	23,200	15	.8	------	.8	54	28	15,500	---------	20,000	500	5	6,000	-------	775	25	2	100,000	-------	100	10	0
7	22,000	14	.8	------	.8	54	28	15,000	---------	3,500	450	3	8,500	-------	500	75	4	100,000	-------	10	10	6
8	20,200	14	.8	------	.5	48	28	10,500	---------	3,200	100	4	11,000	-------	400	75	8	100,000	-------	100	10	0
9	22,900	15	1.0	------	.8	54	26	20,000	---------	1,400	600	4	5,200	-------	300	30	5	100,000	-------	100	10	0
10	21,100	14	1.0	------	.3	62	28	42,000	---------	2,000	500	5	4,000	-------	400	150	6	100,000	-------	1,000	10	0
11	21,300	14	1.0	------	.5	54	30	14,000	---------	1,000	150	3	6,500	-------	275	125	2	100,000	-------	100	10	0
12	21,000	14	.8	------	.0	52	30	66,000	---------	1,600	1,500	4	1,500	-------	350	200	4	100,000	-------	10	10	0
13	22,100	15	1.0	------	.0	52	32	58,000	---------	1,800	1,200	4	2,800	-------	425	100	22	100,000	-------	1,000	10	0
14	19,700	15	1.0	------	.0	52	32	30,000	---------	1,750	950	3	3,500	-------	300	175	5	100,000	-------	1,000	10	1
15	20,600	14	5.0	------	.1	48	26	17,000	---------	1,400	600	6	4,000	-------	150	350	6	100,000	-------	1,000	10	0
16	21,900	14	4.0	------	.1	46	28	30,000	---------	4,000	1,000	2	4,500	-------	250	200	3	100,000	-------	100	10	0
17	20,400	14	3.0	------	1.0	54	34	21,000	---------	2,400	500	5	4,400	-------	250	200	5	100,000	-------	10	10	0
18	20,500	14	4.0	------	.5	54	30	14,000	---------	800	1,000	4	4,000	-------	200	125	4	100,000	-------	10	10	0
19	20,400	14	5.0	------	.5	54	30	44,000	---------	1,200	700	2	2,400	-------	125	75	3	100,000	-------	1,000	10	0
20	20,900	14	6.0	------	.5	52	30	35,000	---------	1,000	650	6	2,500	-------	250	300	5	100,000	-------	1,000	10	1
21	20,900	14	6.0	------	.7	52	30	30,000	---------	5,000	450	85	2,100	-------	350	175	5	100,000	-------	1,000	10	0
22	21,600	14	5.0	------	1.0	52	32	12,000	---------	7,000	200	4	2,500	-------	400	125	5	100,000	-------	1,000	10	1
23	20,100	14	4.0	------	.0	50	30	14,000	---------	7,500	800	2	1,500	-------	175	200	6	100,000	-------	1,000	0	0
24	25,300	14	7.0	------	.8	44	32	10,000	---------	1,400	1,000	2	3,700	-------	500	350	4	100,000	-------	1,000	10	0
25	22,800	13	8.0	------	1.0	60	32	3,400	---------	1,000	375	4	3,000	-------	175	100	13	10,000	-------	10	10	0
26	23,600	13	18.0	------	8.0	54	34	10,000	---------	3,300	600	9	3,800	-------	225	50	7	1,000	-------	10	10	0
27	23,300	12	20.0	------	5.0	52	30	12,000	---------	1,400	150	4	2,200	-------	225	75	10	10,000	-------	10	10	0
28	22,700	12	12.0	------	2.0	52	30	7,500	---------	1,100	300	5	1,500	-------	100	100	8	1,000	-------	100	10	0
29	21,800	12	4.0	------	.8	44	24	3,000	---------	1,000	275	2	1,800	-------	100	75	5	1,000	-------	100	0	3

30......	22, 200	11	6.0	......	2.0	38	22	2, 800	....	800	250	2	1, 500	....	200	100	5	10, 000	....	1, 000	10	0
31......	22, 400	12	5.0	......	3.0	40	20	8, 800	....	2, 200	450	4	2, 200	....	350	125	5	10, 000	....	1, 000	10	0
Mean	21, 900	14	4.4	......	0.9	51	30	19, 900	....	2, 950	570	7	3, 950	....	355	140	6	70, 100	....	835	9.0	0.4
Nov., 1923																						
1.......	21, 800	4	4	......	1	46	20	3, 400	....	2, 400	4	2	2, 400	....	275	14	5	10, 000	....	100	10	0
2.......	21, 300	2	.8	......	.8	40	22	4, 000	....	2, 200	105	65	4, 500	....	200	17	12	10, 000	....	100	10	0
3.......	20, 000	3	5	......	1	42	22	3, 400	....	1, 600	14	5	1, 200	....	140	8	3	10, 000	....	1, 000	0	0
4.......	19, 100	3	4	......	1	40	20	1, 300	....	800	13	6	500	....	200	11	4	10, 000	....	1, 000	10	3
5.......	19, 700	4	.8	......	.5	36	18	1, 200	....	600	13	6	350	....	100	13	4	10, 000	....	100	0	0
6.......	22, 200	5	2	......	.8	40	20	3, 600	....	800	14	5	300	....	50	11	5	10, 000	....	100	0	1
7.......	22, 300	9	2	......	.8	32	16	3, 600	....	600	14	8	300	....	80	23	7	10, 000	....	100	10	0
8.......	23, 800	2	7	......	4	32	12	3, 000	....	800	10	4	600	....	180	17	16	10, 000	....	1, 000	10	3
9.......	22, 900	2	7	......	7	36	20	3, 600	....	600	13	4	425	....	90	14	8	10, 000	....	100	0	0
10......	21, 900	0	10	......	7	40	22	1, 600	....	200	14	4	850	....	100	13	6	10, 000	....	1, 000	10	0
11......	22, 700	2	8	......	5	40	20	1, 800	....	500	13	11	350	....	50	11	4	10, 000	....	1, 000	10	0
12......	20, 700	3	7	......	6	36	20	1, 600	....	600	13	10	375	....	40	5	5	100, 000	....	1, 000	10	4
13......	16, 900	3	6	......	5	38	22	5, 200	....	200	17	6	2, 500	....	90	15	9	10, 000	....	100	0	0
14......	17, 400	3	4	......	2	42	24	1, 400	....	300	15	6	1, 000	....	100	18	9	10, 000	....	10, 000	10	0
15......	20, 700	0	4	......	2	44	24	1, 200	....	200	7	2	1, 100	....	150	17	10	10, 000	....	1, 000	0	0
16......	27, 600	4	6	......	2	48	24	3, 600	....	400	7	6	1, 800	....	200	13	12	10, 000	....	1, 000	0	1
17......	18, 300	6	4	......	4	52	38	1, 600	....	1, 400	12	10	4, 600	....	425	17	15	1, 000	....	1, 000	10	0
18......	19, 600	4	4	......	3	50	38	2, 200	....	400	23	2	250	....	50	4	1	10, 000	....	1, 000	0	0
19......	18, 300	1	3	......	1	50	30	2, 000	....	300	5	3	220	....	40	2	3	10, 000	....	1, 000	10	0
20......	19, 700	1	3	......	.8	50	32	1, 700	....	400	5	1	550	....	50	8	4	10.000	....	1, 000	0	0
21......	19, 900	4	2	......	1	46	28	1, 200	....	400	4	4	1, 800	....	650	4	3	100, 000	....	1, 000	0	0
22......	20, 300	9	2	......	1	46	30	800	....	200	12	2	1, 000	....	120	9	2	10, 000	....	100	10	0
23......	21, 300	1	3	......	1	44	30	1, 800	....	400	8	3	1, 200	....	160	14	5	1, 000	....	1, 000	0	0
24......	19, 300	4	1	......	1	42	28	4, 500	....	3, 000	5	4	1, 300	....	750	14	8	10, 000	....	1, 000	0	0
25......	16, 300	3	3	......	1	42	28	2, 200	....	1, 400	7	3	1, 100	....	500	17	4	10, 000	....	1, 000	0	0
26......	14, 300	3	1	......	.5	44	30	6, 600	....	800	130	1	300	....	20	14	6	10, 000	....	1, 000	0	0
27......	16, 400	4	1	......	.4	44	24	6, 200	....	1, 200	13	4	900	....	80	12	3	10, 000	....	100	0	0
28......	17, 900	4	8	......	.8	38	24	3, 200	....	1, 500	27	1	1, 500	....	50	8	5	10, 000	....	100	10	0
29......	15, 700	4	5	......	.5	38	22	3, 000	....	1, 000	21	2	1, 000	....	50	5	2	10, 000	....	100	0	0
30......	16, 800	8	8	......	4	36	26	5, 600	....	200	38	3	950	....	50	5	4	10, 000	....	100	0	0
Mean	19, 800	4	4	......	2.2	42	24	2, 870	....	850	20	7	1, 175	....	170	12	6	15, 400	....	940	4.3	0.4
Dec., 1923																						
1.......	19, 900	6	20	......	5	36	26	3, 000	....	2, 000	8	4	3, 000	....	225	39	6	1, 000	....	100	0	0
2.......	18, 300	5	20	......	5	42	26	4, 900	....	1, 100	19	3	1, 300	....	90	6	5	1, 000	....	100	0	0
3.......	15, 800	6	25	......	8	22	16	11, 500	....	800	18	3	500	....	400	5	3	10, 000	....	1, 000	0	0
4.......	15, 900	6	20	......	5	24	14	7, 600	....	1, 200	10	0	900	....	800	7	3	1, 000	....	100	0	0
5.......	16, 700	6	18	......	2	26	14	8, 000	....	600	16	3	1, 500	....	1, 200	4	5	1, 000	....	100	0	0
6.......	15, 700	6	12	......	5	26	16	30, 000	....	2, 800	7	3	275	....	150	4	3	1, 000	....	100	0	0
7.......	14, 800	6	20	......	6	30	18	49, 000	....	2, 400	85	2	1, 100	....	30	3	2	10, 000	....	100	0	0
8.......	17, 700	6	20	......	6	26	18	6, 000	....	400	8	3	650	....	250	8	3	10, 000	....	100	0	
9.......	16, 200	6	19	......	5	26	20	7, 000	....	800	3	2	1, 800	....	80	40	3	10, 000	....	100	0	0
10......	20, 300	6	15	......	8	24	12	4, 000	....	600	9	6	1, 700	....	400	6	4	1, 000	....	100	10	0
11......	20, 300	6	18	......	6	24	14	5, 800	....	1, 400	4	2	1, 400	....	90	4	2	100, 000	....	1, 000	0	0

Summary of daily laboratory results reported from each individual plant, located elsewhere than on the Ohio River, included in the survey of 1923–24—Continued

ALBANY (N. Y.) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Dec., 1923	*1,000 gallons*	° *C.*																				
12	20,400	6	18	------	6	24	16	8,000	---------	200	5	3	450	-------	300	6	2	100,000	-------	1,000	0	0
13	20,000	5	8	------	5	28	16	1,600	---------	800	6	3	650	-------	60	4	1	10,000	-------	1,000	0	0
14	20,200	5	12	------	4	32	18	8,600	---------	1,200	12	9	1,800	-------	250	3	1	1,000	-------	1,000	0	0
15	18,900	4	12	------	4	34	20	10,000	---------	1,800	9	2	1,700	-------	375	11	6	1,000	-------	1,000	0	0
16	18,200	4	14	------	4	34	22	14,000	---------	2,400	10	4	800	-------	600	12	8	1,000	-------	1,000	0	0
17	20,800	4	8	------	4	38	20	16,000	---------	2,100	7	1	450	-------	300	5	2	10,000	-------	10,000	0	0
18	17,900	4	8	------	5	36	22	18,000	---------	400	3	2	2,200	-------	240	6	4	10,000	-------	100	0	0
19	14,000	4	6	------	2	38	24	28,500	---------	1,800	9	3	2,100	-------	700	7	3	10,000	-------	100	0	0
20	15,600	4	7	------	7	36	24	1,600	---------	850	28	2	825	-------	150	6	2	10,000	-------	100	0	0
21	18,100	4	8	------	2	38	28	4,000	---------	1,800	18	8	1,000	-------	70	3	2	1,000	-------	1,000	0	0
22	16,300	4	4	------	3	40	32	8,000	---------	4,000	7	4	900	-------	350	3	2	10,000	-------	1,000	0	0
23	14,600	4	4	------	3	42	32	6,000	---------	2,100	18	3	1,200	-------	300	7	3	100,000	-------	1,000	0	0
24	16,000	4	3	------	3	44	26	2,800	---------	2,400	20	3	750	-------	250	8	5	1,000	-------	1,000	0	0
25	16,700	4	3	------	1	44	26	5,000	---------	1,500	24	5	600	-------	200	6	4	1,000	-------	1,000	0	0
26	15,800	4	3	------	1	38	28	10,500	---------	2,800	15	2	1,900	-------	400	6	4	10,000	-------	1,000	0	0
27	12,700	4	3	------	3	38	30	16,000	---------	6,000	19	3	600	-------	160	6	2	10,000	-------	1,000	0	0
28	19,000	4	7	------	1	34	26	18,000	---------	8,000	30	31	1,500	-------	300	8	2	10,000	-------	1,000	0	0
29	14,300	4	8	------	2	38	28	3,400	---------	2,000	13	9	800	-------	200	7	1	1,000	-------	1,000	0	0
30	15,400	4	8	------	4	38	26	5,000	---------	3,000	40	5	900	-------	300	9	1	10,000	-------	1,000	0	0
31	20,500	3	8	------	5	36	26	8,800	---------	2,200	5	3	800	-------	200	28	11	10,000	-------	1,000	0	0
Mean	17,400	5	12	------	4	33	22	15,900	---------	1,380	16	4	1,160	-------	304	9	3	15,000	-------	942	0.3	0
Jan., 1924																						
1	14,400	3	7	------	5	36	26	10,000	---------	2,100	25	3	400	-------	50	4	2	1,000	-------	1,000	0	0
2	15,200	3	8	------	6	36	26	14,000	---------	2,400	26	3	450	-------	60	5	2	1,000	-------	1,000	0	0
3	18,000	3	6	------	3	38	26	7,000	---------	2,800	5	4	275	-------	80	6	5	10,000	-------	1,000	0	0
4	17,000	3	7	------	6	36	28	30,000	---------	6,000	40	8	550	-------	150	5	4	1,000	-------	1,000	0	0
5	15,200	3	6	------	5	36	28	2,800	---------	1,500	100	4	750	-------	300	4	3	10,000	-------	1,000	0	0
6	14,300	3	6	------	5	34	24	1,500	---------	1,200	75	3	800	-------	250	4	2	10,000	-------	1,000	0	0
7	17,200	3	5	------	5	34	24	1,000	---------	1,000	40	4	2,500	-------	300	12	3	1,000	-------	1,000	0	0

8.......	17,800	3	10	------	8	34	22	3,600	------	2,000	45	6	1,100	------	250	6	3	10,000	------	1,000	0	0
9.......	16,800	3	12	------	7	34	24	7,600	------	3,000	40	3	600	------	100	3	2	1,000	------	100	0	0
10......	18,000	3	9	------	3	44	26	2,200	------	1,000	16	4	525	------	200	14	6	1,000	------	100	0	0
11......	19,400	3	10	------	5	44	28	3,600	------	1,600	425	14	1,600	------	300	8	5	10,000	------	1,000	0	0
12......	16,800	4	25	------	8	48	30	5,000	------	1,200	8	4	2,500	------	250	11	7	1,000	------	1,000	0	0
13......	16,300	4	40	------	12	48	30	3,100	------	1,400	12	3	2,000	------	300	10	5	1,000	------	1,000	0	0
14......	16,500	3	48	------	18	34	20	2,600	------	1,200	32	4	700	------	150	8	5	1,000	------	100	0	0
15......	18,700	3	28	------	12	34	18	2,400	------	2,200	75	6	600	------	140	9	7	10,000	------	100	0	0
16......	18,200	3	20	------	8	32	18	2,000	------	1,800	50	13	1,700	------	450	11	8	10,000	------	1,000	0	0
17......	16,900	2	75	------	11	32	20	72,000	------	1,000	15	4	700	------	140	8	5	1,000	------	1,000	0	0
18......	17,900	3	40	------	10	36	18	4,500	------	1,200	22	5	900	------	50	9	6	10,000	------	100	0	0
19......	18,200	2	15	------	8	34	20	1,600	------	1.200	25	3	950	------	300	13	4	10.000	------	100	0	0
20......	15.400	2	15	------	7	34	20	1,400	------	1,000	30	5	800	------	250	12	3	10.000	------	100	0	0
21......	19,200	2	15	------	8	34	20	4.000	------	1,200	105	4	275	------	50	9	6	10,000	------	100	0	0
22......	21,400	2	10	------	6	34	20	2,400	------	2,100	15	6	450	------	50	35	9	10,000	------	100	0	0
23......	20,700	2	12	------	6	26	12	7,600	------	3,600	300	9	1,500	------	175	12	10	1,000	------	100	0	0
24......	21,800	2	8	------	6	26	12	2,400	------	600	45	8	500	------	70	3	2	1,000	------	100	0	0
25......	20,000	2	6	------	4	32	20	46,000	------	4,800	525	12	900	------	120	4	5	1,000	------	100	0	0
26......	19,300	2	9	------	4	32	22	16,000	------	6,000	950	5	1,000	------	175	75	7	10,000	------	1,000	0	0
27......	20,500	1	9	------	4	38	28	15,000	------	4.000	200	7	400	------	160	8	3	10,000	------	1,000	0	0
28......	20,700	1	9	------	5	38	28	13,500	------	1,800	175	5	350	------	150	5	3	10.000	------	1,000	0	0
29......	19,500	1	6	------	4	38	30	9,800	------	2.400	250	7	700	------	120	4	3	1,000	------	100	0	0
30......	20,300	2	6	------	3	52	34	4,400	------	1,400	850	9	1,700	------	375	55	10	1,000	------	1,000	0	0
31......	20,000	2	5	------	4	52	42	6,800	------	3,200	500	25	1,500	------	350	7	4	1,000	------	100	0	0
Mean	18,200	3	16	------	7	37	24	9,900	------	2,200	160	6	950	------	190	12	5	5,350	------	594	0	0
Feb. 1924																						
1.......	19,800	28	6	------	2.5	54	42	24,000	------	15,000	1,400	2	850	------	170	20	2	1,000	------	1,000	0	0
2.......	20,200	28	28	------	5.0	52	40	20,000	------	400	400	11	1,100	------	350	100	4	10,000	------	1,000	10	0
3.......	17,200	28	12	------	4.0	56	40	21,000	------	375	800	10	875	------	275	25	3	10,000	------	1,000	0	0
4.......	17,300	12	5	------	3.0	56	40	2,800	------	400	1,100	5	250	------	120	30	4	1,000	------	1,000	0	0
5.......	18,200	18	4	------	3.0	50	36	3,600	------	800	900	6	975	------	200	110	7	10,000	------	1,000	0	0
6.......	20,100	32	3	------	3.0	48	36	4,200	------	1,600	100	36	1,300	------	425	250	10	10,000	------	100	0	3
7.......	21,000	28	4	------	4.0	38	36	2,400	------	2,800	900	7	3,500	------	500	150	4	100,000	------	1,000	0	4
8.......	19,500	18	4	------	3.0	48	38	8,600	------	600	1,300	27	1,900	------	375	200	4	1,000	------	100	0	0
9.......	19,400	6	4	------	4.0	46	36	4,800	------	1,200	400	3	1,400	------	250	30	5	10,000	------	1,000	0	0
10......	18,100	18	4	------	4.0	46	36	3,600	------	975	375	4	975	------	150	25	4	10,000	------	1,000	0	0
11......	17,700	18	3	------	2.5	52	38	4,600	------	800	300	4	400	------	100	30	3	1,000	------	100	0	0
12......	20,300	8	4	------	4.0	44	38	4,000	------	1,400	500	7	375	------	150	850	2	1,000	------	1,000	10	0
13......	20,200	6	4	------	4.0	46	34	2,400	------	1,400	600	4	400	------	75	100	4	10,000	------	1,000	0	0
14......	19,800	14	3	------	3.0	50	36	2,000	------	1,200	1,800	9	750	------	120	150	5	10,000	------	100	0	0
15......	19,400	24	3	------	2.0	48	40	7,200	------	3,000	1,600	35	400	------	200	100	7	1,000	------	1,000	0	0
16......	18,800	10	4	------	4.0	52	32	10,000	------	2,800	1,000	8	275	------	200	800	7	10,000	------	100	0	0
17......	19,500	10	4	------	3.0	52	32	3,500	------	1,500	600	10	400	------	175	150	5	10,000	------	100	0	0
18......	19,700	13	3	------	2.5	48	38	1,800	------	1,200	400	12	550	------	200	70	25	10,000	------	1,000	0	0
19......	20,300	6	2	------	2.0	50	34	8,000	------	3,600	1,200	50	3,600	------	500	120	5	10,000	------	100	0	0
20......	20,700	12	2	------	2.0	50	38	16,000	------	16,000	1,400	65	1,200	------	310	300	8	10,000	------	1,000	0	0
21......	20,600	26	3	------	2.5	50	38	18,500	------	1,400	800	80	750	------	50	40	9	10,000	------	100	0	0
22......	20,700	26	3	------	2.5	42	34	7,800	------	1,200	700	30	675	------	275	50	6	10,000	------	100	0	0
23......	18,900	18	3	------	3.0	42	34	3,000	------	1,000	600	12	700	------	400	75	4	1,000	------	1,000	0	0
24......	18,600	18	3	------	3.0	40	34	3,600	------	1,500	800	45	1,100	------	875	50	15	1,000	------	1,000	0	0

Summary of daily laboratory results reported from each individual plant, located elsewhere than on the Ohio River, included in the survey of 1923–24—Continued

ALBANY (N. Y.) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Feb., 1924	*1,000 gallons*	*° C.*																				
25	16,900	8	6	......	5.0	40	34	5,000	......	2,800	1,200	175	1,300	......	1,800	50	5	10,000	......	1,000	0	0
26	18,500	20	4	......	4.0	46	32	9,000	......	5,800	700	200	1,100	......	375	150	5	1,000	......	1,000	0	0
27	21,200	14	3	......	2.0	40	32	7,000	......	2,400	500	30	4,400	......	450	150	12	10,000	......	100	0	0
28	23,900	22	6	......	4.0	46	32	4,000	......	2,200	600	40	3,400	......	475	225	10	10,000	......	1,000	0	0
29	25,800	20	4	......	3.0	46	34	13,000	......	8,000	1,300	35	2,000	......	375	300	5	10,000	......	100	0	0
Mean	19,900	18	5	......	3.2	48	36	7,750	......	2,875	840	33	1,275	......	340	160	7	10,300	......	659	0.7	0.2
March, 1924																						
1	23,100	0.5	4	......	4	42	32	2,400	......	1,800	1,800	3	500	......	350	7	3	10,000	......	1,000	0	0
2	19,500	1	3	......	1	42	32	4,000	......	2,100	1,400	10	1,200	......	500	8	3	10,000	......	1,000	0	0
3	19,800	1	2	......	1	40	32	5,600	......	1,000	800	8	2,700	......	650	7	3	10,000	......	1,000	10	0
4	20,600	2	2	......	1	44	28	10,000	......	2,800	1,750	5	2,700	......	800	15	5	100,000	......	100	0	0
5	20,700	2	6	......	5	46	30	4,200	......	3,200	3,000	17	1,200	......	525	15	8	10,000	......	1,000	0	0
6	20,200	2	10	......	4	44	34	44,000	......	6,000	600	55	1,900	......	250	18	7	10,000	......	1,000	0	0
7	20,700	2	20	......	4	50	36	63,000	......	9,000	230	70	2,100	......	375	25	5	10,000	......	1,000	10	0
8	19,900	2	13	......	3	58	38	12,000	......	2,800	36	25	2,800	......	400	14	5	10,000	......	1,000	0	0
9	19,400	2	15	......	3	62	40	13,000	......	2,700	500	20	2,400	......	300	10	3	10,000	......	1,000	0	0
10	20,600	3	20	......	3	60	38	12,000	......	2,600	55	6	1,000	......	120	5	2	10,000	......	100	0	0
11	21,100	3	12	......	2	58	36	21,000	......	1,200	250	12	2,100	......	250	14	7	10,000	......	1,000	0	0
12	20,200	3	12	......	4	56	36	12,000	......	2,800	50	6	1,600	......	250	15	6	10,000	......	1,000	0	0
13	20,700	2	18	......	4	54	36	8,400	......	1,200	65	8	1,700	......	275	9	9	1,000	......	100	0	0
14	20,300	3	9	......	3	62	44	130,000	......	14,000	210	9	1,800	......	275	16	6	1,000	......	1,000	0	0
15	19,900	3	15	......	3	62	40	11,000	......	1,200	20	10	3,000	......	250	29	8	10,000	......	1,000	0	0
16	20,100	3	14	......	3	66	46	12,000	......	1,400	150	15	2,700	......	250	25	8	10,000	......	1,000	10	1
17	18,600	3	8	......	4	58	42	14,000	......	3,800	250	120	2,600	......	150	15	10	1,000	......	100	0	0
18	21,700	2	10	......	2	54	44	1,600	......	1,600	120	30	750	......	100	15	8	10,000	......	1,000	0	0
19	20,200	3	9	......	2	54	40	22,000	......	6,200	75	8	1,100	......	200	15	10	1,000	......	100	0	0
20	20,900	3	8	......	1	54	40	23,000	......	2,800	65	10	850	......	160	12	10	10,000	......	100	0	0
21	19,100	3	8	......	.8	54	42	28,000	......	4,500	500	14	1,000	......	130	12	5	10,000	......	100	0	0
22	22,700	3	8	......	2	62	48	7,200	......	600	90	43	950	......	160	12	8	1,000	......	100	0	0

23	22,600	3	12	......	3	60	42	15,000	......	2,500	100	20	700	......	200	15	7	1,000	......	100	0	0
24	22,600	4	11	......	4	62	48	34,000	......	5,400	65	14	180	......	30	12	8	1,000	......	1,000	0	0
25	21,000	4	25	......	6	56	44	66,000	......	6,800	300	30	450	......	150	45	8	10,000	......	100	0	0
26	23,600	4	35	......	6	54	38	20,000	......	2,000	35	8	650	......	60	18	5	1,000	......	10	0	0
27	24,400	4	32	......	7	54	36	38,000	......	4,800	85	8	1,100	......	140	6	5	1,000	......	100	10	0
28	24,400	4	35	......	7	46	32	300,000	......	38,000	180	8	450	......	70	6	5	1,000	......	1,000	0	0
29	23,000	3	35	......	5	48	32	23,000	......	21,000	200	13	1,200	......	210	7	4	10,000	......	1,000	0	0
30	23,200	3	40	......	8	52	46	22,000	......	17,000	150	10	1,000	......	250	8	3	10,000	......	100	0	0
31	22,100	3	45	......	12	50	44	24,000	......	9,200	45	6	1,200	......	275	7	4	1,000	......	100	10	0
Mean	21,200	3	16	......	4	54	39	31,000	......	5,900	425	20	1,500	......	260	14	6	9,710	......	593	1.6	0.03
April, 1924																						
1	22,900	3	38	......	6	46	34	8,400	......	2,200	45	4	900	......	180	43	4	1,000	......	10	10	1
2	22,400	3	30	......	7	42	30	9,400	......	4,500	50	5	800	......	275	12	5	100	......	100	0	0
3	20,700	4	60	......	6	34	30	12,000	......	2,600	17	10	650	......	130	11	10	1,000	......	10	10	0
4	21,300	4	50	......	3	42	28	6,400	......	5,800	100	5	950	......	140	30	5	10,000	......	100	10	0
5	21,000	4	40	......	8	42	28	4,200	......	800	4	3	500	......	400	13	3	100	......	1,000	0	0
6	23,300	4	60	......	5	36	38	8,100	......	2,000	25	6	850	......	550	12	6	100	......	100	0	0
7	20,600	4	85	......	4	32	30	39,000	......	1,800	100	20	3,700	......	90	8	7	10,000	......	100	0	0
8	20,000	4	550	......	5	32	30	27,000	......	1,000	47	52	1,100	......	70	7	5	10,000	......	10	0	0
9	15,500	4	170	......	3	46	24	200,000	......	1,600	95	27	9,300	......	60	18	11	1,000	......	10	0	0
10	17,200	2	50	......	3	38	18	100,000	......	1,500	850	150	1,200	......	100	3	2	100,000	......	10	0	0
11	16,200	2	40	......	3	38	24	75,000	......	5,000	250	60	1,400	......	150	6	5	1,000	......	100	0	0
12	18,700	2	75	......	7	38	26	20,000	......	2,000	30	20	900	......	150	12	2	1,000	......	1,000	0	0
13	19,000	2	50	......	4	36	24	15,000	......	2,300	50	30	2,900	......	100	6	5	1,000	......	1,000	0	0
14	19,500	3	25	......	2	32	22	4,200	......	1,000	20	12	130	......	50	5	5	1,000	......	100	0	0
15	21,500	3	19	......	2	30	22	9,600	......	600	65	42	160	......	100	7	4	1,000	......	100	0	0
16	21,300	3	10	......	3	34	24	19,000	......	1,400	6	5	150	......	40	5	3	1,000	......	1,000	10	1
17	24,400	4	15	......	6	32	20	11,500	......	3,000	10	8	850	......	140	8	5	1,000	......	100	0	0
18	18,500	2	12	......	3	32	18	9,000	......	1,200	20	4	1,200	......	300	6	4	1,000	......	100	0	0
19	19,800	3	18	......	6	30	16	40,000	......	7,800	20	10	450	......	150	7	4	1,000	......	100	0	0
20	17,100	3	25	......	8	32	18	30,000	......	2,500	50	22	500	......	130	4	3	1,000	......	100	0	0
21	16,700	3	50	......	12	36	22	34,500	......	3,600	70	8	400	......	70	3	2	1,000	......	100	10	0
22	18,100	3	70	......	8	38	22	31,000	......	4,200	17	6	350	......	70	3	3	1,000	......	10	0	0
23	18,700	2	30	......	10	40	24	6,000	......	2,800	28	21	70	......	30	4	3	100	......	100	0	0
24	18,700	2	45	......	8	48	22	5,000	......	400	150	3	450	......	60	17	8	1,000	......	1,000	0	0
25	20,000	2	90	......	10	36	24	16,500	......	25,000	48	32	750	......	70	4	3	1,000	......	100	0	0
26	20,000	2	36	......	7	44	22	39,000	......	3,000	80	24	250	......	120	7	5	1,000	......	100	0	0
27	18,600	2	20	......	6	42	20	22,000	......	6,500	36	12	375	......	70	4	3	1,000	......	100	0	0
28	20,200	4	13	......	6	30	24	22,500	......	3,000	34	8	650	......	120	3	2	10,000	......	100	0	0
29	20,700	4	7	......	4	30	22	22,000	......	2,600	58	4	450	......	70	4	3	100	......	100	0	0
30	21,100	5	8	......	3	32	24	13,000	......	3,000	95	23	750	......	250	5	4	10,000	......	100	0	0
Mean	19,800	3	60	......	6	37	24	28,500	......	3,500	80	21	1,100	......	140	9	4	5,650	......	232	1.7	0.06

Summary of daily laboratory results reported from each individual plant, located elsewhere than on the Ohio River, included in the survey of 1923–24—Continued

ALBANY (N. Y.) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
May, 1924	*1,000 gallons*	° *C.*																				
1	22, 200	4	8	......	3	30	24	4, 800	....	1, 200	40	4	2, 000	......	350	5	5	1, 000	......	1, 000	0	0
2	22, 100	5	7	......	3	36	20	8, 800	....	2, 200	25	4	250	......	20	4	1	100	......	1, 000	10	0
3	21, 400	5	12	......	4	32	22	4, 600	....	5, 800	45	4	800	......	700	7	4	1, 000	......	100	0	0
4	21, 800	5	6	......	4	36	20	5, 200	....	4, 200	24	8	800	......	300	6	3	1, 000	......	100	0	0
5	21, 300	5	35	......	1	32	22	7, 200	....	1, 400	32	4	60	......	20	3	3	10, 000	......	100	0	1
6	20, 100	5	32	......	4	34	20	4, 600	....	2, 200	47	11	80	......	40	2	1	10, 000	......	100	0	0
7	20, 300	5	18	......	5	28	20	12, 000	....	1, 000	175	8	250	......	120	6	4	1, 000	......	100	0	0
8	19, 100	6	11	......	7	28	20	9, 600	....	1, 600	95	3	70	......	50	2	2	1, 000	......	100	0	1
9	19, 700	6	9	......	2	26	16	13, 000	....	2, 000	72	41	425	......	100	5	4	10, 000	......	1, 000	0	3
10	19, 000	6	8	......	3	28	20	18, 500	....	150, 000	53	3	300	......	250	4	3	10, 000	......	100	0	1
11	18, 300	6	10	......	4	28	20	11, 000	....	26, 500	27	12	200	......	100	3	1	10, 000	......	100	0	0
12	19, 200	5	9	......	2	36	20	3, 000	....	800	18	3	650	......	400	4	3	1, 000	......	1, 000	0	3
13	20, 300	6	8	......	2	46	26	4, 400	....	4, 400	85	8	450	......	80	1	1	1, 000	......	100	0	1
14	20, 600	7	70	......	3	28	20	4, 600	....	4, 200	16	3	600	......	70	5	3	10, 000	......	100	10	3
15	20, 100	7	150	......	6	34	20	12, 000	....	7, 800	33	2	750	......	80	3	2	10, 000	......	1, 000	0	2
16	18, 100	7	60	......	5	32	22	4, 800	....	400	110	4	1, 300	......	50	1	1	10, 000	......	100	10	0
17	21, 600	7	12	......	4	36	20	3, 000	....	1, 000	10	3	575	......	30	2	2	10, 000	......	100	0	0
18	22, 900	7	50	......	6	34	20	5, 300	....	3, 300	28	4	725	......	150	2	1	10, 000	......	100	0	0
19	22, 900	7	8	......	5	36	20	35, 000	....	27, 000	18	3	375	......	75	3	2	1, 000	......	1, 000	0	0
20	21, 800	8	8	......	3	34	20	4, 800	....	4, 100	17	17	275	......	120	1	1	1, 000	......	100	0	0
21	20, 900	8	6	......	4	36	20	2, 000	....	1, 400	10	1	275	......	50	2	2	1, 000	......	1, 000	0	1
22	21, 500	8	5	......	4	32	22	3, 800	....	3, 100	35	1	750	......	2, 800	6	3	10, 000	......	1, 000	0	0
23	19, 100	8	4	......	2	36	20	5, 000	....	3, 200	6	2	100	......	1, 400	2	1	1, 000	......	100	0	2
24	19, 600	8	4	......	4	32	22	12, 000	....	7, 200	5	2	800	......	120	3	2	1, 000	......	1, 000	0	3
25	18, 800	8	6	......	2	36	20	11, 000	....	8, 000	31	3	425	......	250	3	2	1, 000	......	1, 000	0	0
26	20, 300	7	8	......	2	38	28	1, 600	....	1, 500	28	4	250	......	120	1	1	1, 000	......	100	10	0
27	20, 800	5	12	......	3	36	20	15, 500	....	12, 500	7	1	180	......	30	1	1	10, 000	......	1, 000	0	0
28	20, 000	6	3	......	3	36	20	7, 200	....	6, 200	5	4	130	......	50	3	3	1, 000	......	1, 000	0	0
29	20, 200	6	8	......	4	48	32	6, 400	....	5, 800	14	7	110	......	20	2	1	1, 000	......	1, 000	0	0
30	19, 700	8	30	......	4	34	20	5, 200	....	3, 100	12	6	200	......	30	1	1	1, 000	......	1, 000	0	0
31	20, 800	8	35	......	4	36	20	300, 000	....	250, 000	11	1	100	......	90	1	1	10, 000	......	1, 000	0	0
Mean	20, 500	6	21	......	4	34	21	17, 600	....	17, 800	37	6	450	......	250	3	2	4, 750	......	536	1. 3	0. 7

June, 1924																					
1........	15,200	....	8	......	3	38	28	12,000	....	10,000	12	5	170	....	2,200	7	2	1,000	....	1,000	0	0
2........	17,700	....	3	......	1	48	32	6,000	....	4,200	18	2	525	....	2,300	8	6	1,000	....	1,000	0	0
3........	22,300	....	3	......	2	38	28	11,000	....	8,400	43	33	150	....	1,150	6.	2	1,000	....	1,000	0	0
4........	18,200	....	8	......	3	48	32	11,000	....	5,400	11	22	150	....	600	3	2	10,000	....	1,000	0	0
5........	18,200	....	4	......	1	46	30	8,600	....	1,600	5	4	650	....	100	3	5	10,000	....	100	0	0
6........	18,900	....	6	......	2	44	28	13,500	....	14,000	7	3	250	....	40	2	1	1,000	....	1,000	0	0
7........	21,000	....	8	......	3	48	32	4,000	....	1,600	5	3	300	....	700	4	2	1,000	....	1,000	0	0
8........	21,000	....	6	......	1	54	38	3,000	....	1,200	8	5	1,100	....	800	5	3	1,000	....	1,000	0	0
9........	18,700	....	4	......	1	48	32	2,400	....	1,400	5	4	500	....	1,400	5	3	100,000	....	1,000	0	1
10........	21,000	....	8	......	4	52	36	5,000	....	2,600	15	3	350	....	2,300	6	4	10,000	....	1,000	0	1
11........	20,900	....	8	......	2	48	30	2,400	....	8,600	22	16	550	....	60	24	22	1,000	....	100	0	0
12........	21,100	....	8	......	3	50	32	5,000	....	1,400	70	8	600	....	1,500	18	12	10,000	....	1,000	0	1
13........	21,100	....	8	......	3	50	32	13,000	....	400	31	5	350	....	90	5	5	100,000	....	1,000	10	0
14........	19,900	....	8	......	2	48	30	6,000	....	2,400	12	5	1,100	....	975	10	8	1,000	....	100	10	0
15........	19,900	....	8	......	2	48	30	10,000	....	6,100	17	4	500	....	500	16	8	1,000	....	100	0	0
16........	18,200	....	8	......	2	48	32	110,000	....	180,000	33	4	50	....	300	5	3	1,000	....	1,000	10	0
17........	19,000	....	7	......	2	56	32	5,400	....	7,800	38	3	50	....	1,400	7	3	10,000	....	1,000	10	0
18........	20,100	....	3	......	1	50	36	12,000	....	6,400	130	13	7,300	....	5,300	5	4	1,000	....	1,000	10	0
19........	21,100	....	6	......	4	50	36	13,000	....	3,000	100	30	6,600	....	1,300	1,000	6	10,000	....	100	10	0
20........	25,000	....	8	......	6	50	40	18,000	....	7,000	17	17	2,100	....	140	3	3	10,000	....	1,000	10	0
21........	15,900	....	8	......	4	52	44	6,400	....	4,700	60	4	900	....	350	3	2	1,000	....	1,000	10	1
22........	21,500	....	8	......	4	58	38	12,000	....	5,100	20	5	500	....	100	13	1	1,000	....	1,000	10	0
23........	21,500	....	8	......	3	58	38	50,000	....	1,200	7	5	230	....	30	5	2	10,000	....	10,000	10	0
24........	21,100	....	8	......	4	62	36	7,200	....	2,600	45	32	2,000	....	160	2	1	10,000	....	10,000	10	0
25........	21,400	....	5	......	2	62	36	4,000	....	2,200	28	6	2,500	....	850	7	5	1,000	....	1,000	10	0
26........	21,500	....	3	......	2	58	38	8,600	....	3,000	27	23	3,600	....	500	6	5	10,000	....	1,000	10	0
27........	20,900	....	4	......	2	62	36	6,000	....	3,400	100	20	7,000	....	1,900	2	1	10,000	....	1,000	10	0
28........	21,200	....	8	......	6	52	32	23,000	....	1,200	14	2	1,500	....	190	33	0	10,000	....	10,000	0	0
29........	21,700	....	6	......	3	62	36	12,000	....	1,500	230	14	1,200	....	300	2	1	10,000	....	10,000	0	0
30........	21,200	....	8	......	5	58	38	6,400	....	600	25	18	2,000	....	3,100	18	15	10,000	....	10,000	0	0
Mean	20,200	....	6	......	3	51	34	13,563	....	9,967	38	11	1,492	....	1,021	41	4.6	11,800	....	2,350	4.7	0.1
July 1924																					
1........	20,600	21	8	......	4	54	28	3,000	....	3,000	90	3	950	....	325	5	3	10,000	....	100	0	0
2........	23,300	21	7	......	4	56	30	26,000	....	7,000	19	12	4,000	....	1,900	325	3	10,000	....	100	0	0
3........	22,800	21	7	......	3	54	30	10,000	....	2,000	95	45	6,500	....	3,000	220	5	10,000	....	100	10	0
4........	22,200	22	8	......	3	56	26	11,000	....	2,200	85	18	3,100	....	2,100	110	7	10,000	....	100	0	0
5........	22,200	22	8	......	3	54	20	15,000	....	2,100	70	19	3,300	....	2,000	55	11	10,000	....	100	0	0
6........	23,300	22	7	......	3	56	30	12,500	....	2,400	80	22	2,900	....	1,800	43	6	1,000	....	1,000	0	0
7........	22,100	22	10	......	6	54	30	13,000	....	2,200	100	25	1,200	....	400	30	2	100,000	....	10,000	0	0
8........	20,900	21	7	......	4	60	30	14,500	....	1,500	75	20	2,600	....	2,300	10	4	10,000	....	100	10	0
9........	24,000	21	8	......	4	58	32	20,000	....	1,250	65	21	4,600	....	750	10	6	10,000	....	1,000	10	0
10........	21,000	22	4	......	3	60	30	18,750	....	1,300	70	22	3,300	....	1,900	12	11	10,000	....	1,000	0	1
11........	21,000	22	2	......	1	54	30	13,400	....	1,250	80	20	1,700	....	400	33	21	1,000	....	100	0	0
12........	21,500	22	4	......	2	60	30	12,000	....	1,300	45	20	6,000	....	4,000	18	14	1,000	....	100	0	0
13........	22,500	22	3	......	1	54	30	12,800	....	5,000	100	27	5,000	....	2,000	12	7	10,000	....	100	0	0
14........	21,000	22	7	......	2	56	28	13,000	....	4,500	150	30	2,500	....	1,400	10	8	10,000	....	100	0	0
15........	21,500	21	3	......	1	58	32	17,700	....	6,000	175	28	2,000	....	450	5	3	1,000	....	1,000	0	1
16........	21,700	22	5	......	4	60	38	20,000	....	6,500	80	22	1,500	....	30	13	12	100,000	....	1,000	0	0

Summary of daily laboratory results reported from each individual plant, located elsewhere than on the Ohio River, included in the survey of 1923–24—Continued

ALBANY (N. Y.) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
July, 1924	*1,000 gallons*	° *C.*																				
17	20,000	22	7	------	5	62	32	25,000	--------	7,000	75	22	2,500	------	1,000	8	5	10,000	------	100	0	0
18	19,000	22	6	------	5	64	32	27,000	--------	7,500	60	18	2,000	------	1,500	11	10	10,000	------	100	0	0
19	21,400	22	5	------	3	60	42	25,000	--------	6,500	75	25	1,400	------	600	17	12	10,000	------	100	0	0
20	21,600	22	5	------	4	64	32	22,000	--------	6,000	80	22	1,200	------	700	14	8	1,000	------	10,000	0	0
21	20,500	20	3	------	3	64	32	20,000	--------	7,500	70	20	1,500	------	1,100	5	1	1,000	------	100	0	0
22	20,800	20	3	------	2	68	38	25,000	--------	7,500	45	18	4,000	------	1,900	250	11	1,000	------	100	0	0
23	20,700	20	4	------	4	64	36	12,500	--------	3,000	55	20	6,100	------	2,300	31	6	10,000	------	1,000	0	0
24	21,000	24	4	------	4	66	34	12,000	--------	4,000	60	22	3,800	------	2,600	160	34	10,000	------	1,000	0	0
25	21,700	22	4	------	4	60	34	18,500	--------	5,600	85	21	3,100	------	2,100	18	12	1,000	------	100	0	0
26	19,900	20	7	------	4	64	30	14,500	--------	4,800	90	20	5,900	------	2,300	14	7	1,000	------	100	0	0
27	19,900	21	7	------	3	60	34	12,000	--------	2,500	65	15	5,100	------	2,400	19	14	1,000	------	100	0	0
28	21,800	20	5	------	2	58	26	17,000	--------	3,000	60	14	2,600	------	1,400	22	11	10,000	------	100	0	0
29	21,100	22	4	------	3	60	28	18,500	--------	4,500	75	20	1,800	------	60	10	8	10,000	------	100	0	0
30	21,900	22	4	------	3	68	36	12,800	--------	2,700	80	25	4,600	------	130	3	2	1,000	------	1,000	0	0
31	21,700	22	4	------	3	66	34	12,000	--------	2,000	75	20	5,300	------	120	1	1	1,000	------	1,000	0	0
Mean	21,400	21	6	------	3	60	31	16,750	--------	3,975	77	21	3,300	------	1,450	48	9	12,300	------	1,000	1.0	0.07
Aug., 1924																						
1	20,800	20	4	------	4	62	30	26,000	--------	1,500	70	5	20,500	------	3,300	2	1	1,000	------	100	0	0
2	20,000	20	2	------	1	64	30	14,000	--------	1,600	31	2	7,900	------	350	2	2	10,000	------	10,000	0	0
3	19,200	20	4	------	3	64	30	11,500	--------	1,200	42	10	7,100	------	900	3	2	10,000	------	10,000	0	0
4	20,900	20	5	------	5	62	30	7,000	--------	750	27	2	3,500	------	275	5	3	1,000	------	100	0	0
5	21,300	20	4	------	2	66	32	1,000	--------	800	18	4	1,800	------	1,600	1	1	1,000	------	100	0	0
6	21,200	20	3	------	3	66	32	22,000	--------	1,200	8	7	9,200	------	400	2	1	10,000	------	1,000	0	1
7	22,000	20	7	------	1	66	30	32,000	--------	1,400	4	3	20,000	------	190	1	1	10,000	------	100	0	0
8	21,200	20	8	------	3	66	32	850,000	--------	1,300	16	11	16,000	------	550	2	1	10,000	------	1,000	0	0
9	22,300	20	3	------	3	64	30	14,500	--------	6,000	650	33	12,000	------	1,800	170	7	10,000	------	100	0	0
10	21,200	20	5	------	3	64	30	15,500	--------	1,600	400	21	10,500	------	800	150	8	10,000	------	100	0	0
11	20,900	20	5	------	3	62	28	3,800	--------	2,400	180	23	4,300	------	120	180	5	10,000	------	1,000	0	0

12......	20,900	20	4	......	4	60	28	1,200	....	600	18	14	5,700	....	950	3	2	10,000	....	100	0	1
13......	21,300	20	2	......	2	66	28	4,000	....	1,800	16	2	5,600	....	2,400	3	1	10,000	....	1,000	0	0
14......	21,200	20	3	......	3	64	30	7,600	....	3,200	12	12	6,000	....	550	9	4	10,000	....	1,000	0	0
15......	22,300	20	2	......	2	66	28	6,600	....	600	20	4	1,800	....	1,800	5	3	1,000	....	100	0	0
16......	21,200	20	3	......	2	64	28	4,400	....	1,700	10	6	10,000	....	425	6	3	1,000	....	100	0	0
17......	20,200	20	3	......	2	64	24	4,600	....	1,200	15	11	5,600	....	1,050	10	2	1,000	....	100	0	0
18......	20,400	20	2	......	1	60	28	1,000	....	200	13	4	6,400	....	1,900	26	6	1,000	....	100	0	0
19......	21,100	20	2	......	1	64	32	8,600	....	7,100	18	1	8,700	....	1,500	9	6	10,000	....	100	0	0
20......	21,600	20	2	......	1	56	30	7,200	....	600	7	4	4,100	....	3,000	3	2	1,000	....	1,000	0	0
21......	20,800	20	2	......	.7	66	30	11,000	....	800	19	3	7,600	....	4,100	5	3	1,000	....	100	0	0
22......	22,600	20	3	......	.8	66	30	18,000	....	14,000	13	4	11,000	....	4,900	6	2	10,000	....	100	0	2
23......	20,300	20	3	......	.7	66	30	7,000	....	2,600	30	21	24,000	....	7,400	3	1	1,000	....	100	0	0
24......	19,600	20	2	......	.5	56	26	8,800	....	4,700	4	3	10,500	....	3,800	5	3	1,000	....	100	0	0
25......	21,100	21	5	......	1	66	30	15,000	....	9,200	12	10	4,300	....	3,100	3	2	1,000	....	100	0	0
26......	20,100	20	1	......	1	64	32	7,800	....	6,000	5	2	6,000	....	3,800	15	6	10,000	....	1,000	0	0
27......	22,400	20	2	......	1	66	30	6,600	....	5,000	29	15	9,200	....	3,300	2	1	1,000	....	100	0	0
28......	22,600	20	1	......	1	66	30	13,500	....	800	55	20	6,700	....	2,500	3	2	1,000	....	100	0	1
29......	23,300	20	1	......	1	64	32	8,000	....	1,100	16	6	6,800	....	3,100	4	2	1,000	....	1,000	0	1
30......	24,000	20	1	......	1	66	30	18,500	....	10,500	48	12	5,100	....	4,600	3	1	1,000	....	1,000	10	1
31......	21,600	20	2	......	1	66	30	12,000	....	4,600	34	33	5,300	....	300	3	2	1,000	....	1,000	0	0
Mean	21,300	20	3	......	1.9	64	30	37,700	....	3,050	59	10	8,500	....	2,100	21	3	5,060	....	1,030	0.3	0.2
Sept., 1924																						
1......	19,190	20	1	......	1	46	22	1,500	....	1,200	51	3	5,100	....	3,700	21	4	10,000	....	1,000	0	0
2......	21,560	20	1	......	1	48	26	1,200	....	1,100	60	4	5,900	....	3,100	23	4	10,000	....	1,000	0	0
3......	22,670	20	1	......	.8	42	30	2,800	....	1,600	22	2	6,600	....	4,900	10	2	10,000	....	100	0	0
4......	20,520	20	2	......	.8	46	22	51,000	....	3,000	28	6	23,000	....	16,500	48	44	10,000	....	1,000	10	0
5......	21,320	20	1	......	.8	48	26	50,000	....	1,800	19	7	25,000	....	15,000	20	16	1,000	....	1,000	0	0
6......	21,270	20	2	......	1	42	30	40,000	....	2,500	150	55	14,000	....	9,700	15	10	10,000	....	1,000	10	0
7......	21,000	20	3	......	1	50	26	29,000	....	2,800	70	2	14,500	....	1,000	18	8	10,000	....	1,000	0	0
8......	19,810	20	3	......	1	46	22	3,600	....	400	15	12	3,100	....	8,000	14	3	1,000	....	1,000	0	0
9......	21,480	20	4	......	1	48	24	14,000	....	800	4	0	12,500	....	5,700	11	3	10,000	....	1,000	0	0
10......	22,442	19	17	......	1	46	22	32,000	....	30,500	3	1	15,500	....	14,000	2	1	10,000	....	1,000	0	0
11......	20,880	19	11	......	1	48	26	10,000	....	1,600	3	1	9,200	....	100	1	1	10,000	....	1,000	0	1
12......	22,580	18	5	......	.8	50	26	11,000	....	9,000	10	5	800	....	110	3	0	1,000	....	100	0	0
13......	22,800	18	3	......	.8	42	30	6,000	....	6,200	7	3	90	....	10	11	3	1,000	....	10	0	0
14......	21,160	18	4	......	2	42	30	8,000	....	5,000	8	2	1,000	....	800	10	3	10,000	....	100	0	0
15......	21,650	18	6	......	2	56	28	2,200	....	1,400	10	2	1,700	....	1,100	3	3	10,000	....	100	0	0
16......	22,500	18	2	......	1	48	26	24,000	....	600	70	2	5,500	....	3,300	2	2	10,000	....	100	0	0
17......	21,050	18	2	......	1	46	22	7,400	....	3,000	8	4	4,500	....	1,500	5	3	1,000	....	1,000	0	0
18......	20,950	18	2	......	1	48	26	11,000	....	600	4	1	800	....	10	7	4	1,000	....	1,000	0	0
19......	21,150	18	2	......	1	50	26	24,000	....	2,200	20	2	1,600	....	1,100	2	2	10,000	....	100	0	0
20......	22,400	20	1	......	.5	50	26	30,000	....	800	19	6	300	....	60	6	0	10,000	....	1,000	10	0
21......	21,130	19	1	......	1	46	22	8,000	....	400	17	14	1,400	....	800	3	2	10,000	....	1,000	0	0
22......	22,560	18	.8	......	.5	48	24	5,200	....	800	4	3	2,600	....	1,100	4	2	100,000	....	10	0	1
23......	23,708	18	1	......	.8	54	26	2,200	....	600	3	3	2,100	....	200	5	2	10,000	....	100	0	0
24......	25,630	18	3	......	.8	58	30	4,500	....	800	19	5	1,800	....	300	7	3	1,000	....	1,000	0	1
25......	24,660	18	3	......	.8	56	30	16,000	....	2,400	4	2	2,000	....	700	8	2	10,000	....	1,000	0	0
26......	25,008	20	1	......	.8	54	28	11,000	....	3,800	5	4	4,000	....	1,700	0	1	1,000	....	1,000	0	1
27......	23,530	18	2	......	.8	56	32	7,200	....	400	6	0	2,500	....	500	10	7	10,000	....	1,000	10	0

Summary of daily laboratory results reported from each individual plant, located elsewhere than on the Ohio River, included in the survey of 1923-24—Continued

ALBANY (N. Y.) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Sept., 1924	*1,000 gallons*	° *C.*																				
28	25,510	18	2	------	0.8	54	28	5,100	--------	700	8	6	1,400	-------	100	8	2	10,000	-------	1,000	0	0
29	24,180	18	2	------	.8	48	26	6,200	--------	400	12	4	2,000	-------	650	7	5	100,000	-------	10	0	0
30	24,007	18	2	------	1	48	26	7,600	--------	200	10	3	650	-------	250	5	4	100,000	-------	10	0	0
Mean	22,300	19	3	------	1	49	26	14,450	--------	2,860	22	5.5	5,710	-------	3,175	10	5.5	16,600	-------	658	1.3	0.1

CHESTER (PA.) WATER FILTRATION PLANT

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Oct., 1923																						
1	6,115	------	50	------	------	71	52	--------	--------	--------	--------	------	2,300	-------	550	-------	0	22,600	-------	50	-------	0
2	5,310	------	50	------	------	67	53	--------	--------	--------	--------	------	76,000	-------	1,800	-------	4	46,000	-------	100	-------	0
3	5,180	------	65	------	------	66	52	--------	--------	--------	--------	------	6,300	-------	2,800	-------	0	44,200	-------	100	-------	0
4	5,500	------	120	------	------	67	50	--------	--------	--------	--------	------	12,000	-------	1,700	-------	0	8,200	-------	-------	-------	0
5	5,500	------	120	------	------	63	49	--------	--------	--------	--------	------	4,300	-------	1,400	-------	0	6,400	-------	100	-------	0
6	5,500	------	65	------	------	65	49	--------	--------	--------	--------	------	3,500	-------	-------	-------	1	8,200	-------	-------	-------	0
7	5,200	------	60	------	------	60	51	--------	--------	--------	--------	------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
8	5,945	------	90	------	------	63	48	--------	--------	--------	--------	------	5,700	-------	2,800	-------	1	4,600	-------	100	-------	0
9	5,955	------	80	------	------	65	49	--------	--------	--------	--------	------	4,300	-------	2,800	-------	0	28,000	-------	100	-------	0
10	5,950	------	60	------	------	65	45	--------	--------	--------	--------	------	2,500	-------	-------	-------	1	4,600	-------	-------	-------	-------
11	5,710	------	55	------	------	58	49	--------	--------	--------	--------	------	5,900	-------	1,900	-------	1	10,000	-------	1,000	-------	0
12	5,760	------	65	------	------	60	45	--------	--------	--------	--------	------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
13	5,730	------	55	------	------	61	49	--------	--------	--------	--------	------	-------	-------	-------	-------	-------	82,000	-------	-------	-------	0
14	5,040	------	------	------	------	------	------	--------	--------	--------	--------	------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
15	5,235	------	50	------	------	65	50	--------	--------	--------	--------	------	6,400	-------	2,800	240	0	46,000	-------	1,000	6	0
16	6,330	------	45	------	------	64	51	--------	--------	--------	--------	------	5,000	-------	240	200	0	28,000	-------	100	2	0
17	5,745	------	60	------	------	60	47	--------	--------	--------	--------	------	2,500	-------	1,400	600	0	10,000	-------	1,000	8	0
18	5,535	------	55	------	15	62	50	--------	--------	--------	--------	------	48,000	-------	180	100	1	2,800	-------	100	0	0
19	5,725	------	70	------	10	59	46	--------	--------	--------	--------	------	2,100	-------	500	150	0	6,400	-------	550	4	0

20	5,135		75			63	48											26,200				0
21	5,170																					
22	5,875		95		8	55	45						2,400		300	180	0	8,200		1,000	8	0
23	5,560		140		7	58	41						7,200		700	150	1	4,600		1,000	8	0
24	5,270		110		10	58	43						7,000		450	100	0	6,200		1,000	2	0
25	5,680		100		5	56	38						16,000		1,200	75	1	28,000		1,000	6	0
26	6,230		65		8	60	40						12,000		400	100	0	62,000		1,000	2	0
27	6,090		55		18	63	40						8,000				0	8,200				0
28	4,970				15	61	45									1,400	1				10	
29	6,305		45		7	56	42						3,800		1,200	230	3	10,000		550	4	0
30	6,630		40		8	60	44						1,500		700	150	0	8,200		1,000	8	0
31	6,175		55		10	50	44						5,200		1,000	130	1	64,000		1,000	8	0
Mean	5,680		69		10	62	45						10,000		1,280	270	1	22,400		592	5.4	0
Nov., 1923																						
1	5,700		50		10	55	46						3,000		300	100	2	8,200		1,000	8	2
2	5,520		45		5	54	45						2,400		600	180	0	42,400		1,000	8	0
3	5,400		45		5	52	40						3,600				0	26,200				0
4	4,980																					
5	7,040		90		5	50	40						2,200		100	30	0	6,200		550	8	0
6	5,975		90		5	50	40						800		30	20	0	24,400		1,000	6	0
7	5,615		90		5	48	42						4,400		140	70	0	44,200		1,000	6	0
8	6,365		80		5	49	37						7,000		350	0	0	6,400		100	0	0
9	6,135		80		5	48	40						1,400		150	15	1	42,400		1,000	2	0
10	6,080		55			45												8,200				0
11	6,130																					
12	5,420					47																
13	5,980		60		7	47	39						3,400		70	0	0	80,200		10	0	0
14	6,380		50		6	45	36						1,700		100	3	2	8,200		100	0	0
15	6,440		75		10	44	37						700		50	2	0	6,400		50	0	0
16	6,230		50		20	48	40						1,000		150	3	0	2,800		1,000		0
17	5,745		65		10	45	39											82,000				0
18	4,355																					
19	6,195		140		10	40	37								3,800			40,600		50	0	0
20	6,580		130		7	43	37						4,400		1,200	5		2,800		50	2	0
21	5,885		100		15	42	38						6,000		750	10	2	28,000		50	0	0
22	5,955		150		18	44	41						30,000		70	14	0	20,800		500	0	0
23	6,055		85		7	44	34						2,900		60	4	1	2,800		500	0	0
24	5,665		70		5	44	35						4,900				0	10,000				0
25	4,730																					
26	6,060		55		5	45	36						35,000		100	1	1	64,000		50	0	0
27	6,315		60		10	44	35						49,000		200	4	4	10,000		50	0	0
28	5,440		6[illegible]		5	45	38								150	7		6,400		1,000		0
29	5,445																					
30	5,540		65		10	44	34						31,000		350	5	0	62,200		10	0	0
Mean	5,845		77		8	46	38						9,700		436	25	1	26,500		454	2.2	0.1

Summary of daily laboratory results reported from each individual plant, located elsewhere than on the Ohio River, included in the survey of 1923–24—Continued

CHESTER (PA.) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Dec., 1923	*1,000 gallons*	*° C.*																				
1	5,590		70		5	44	38											28,000				0
2	4,710																					
3	5,670		40		5	46	43						21,000		1,500	14	2	28,000		50	4	0
4	6,350		70		8	47	40						1,200		80	18	1	26,200		1,000	2	0
5	5,740		130		10	45	38						8,000		400	30	2	2,800		100	8	0
6	6,260		70		10	45	35						4,800		100	3	0	2,800		550	10	0
7	6,140		100		5	32	26						3,200		50	6	0	24,400		100	0	0
8	6,050		100		10	30	22											60,400				0
9	4,665																					
10	6,290		90		12	28	20						7,400		100	1	1	2,800		50	0	0
11	6,985		90		7	27	18						1,800		100	1	0	4,600		50	0	0
12	7,140		70		7	20	13						1,800		70	12	1	2,800		10	0	0
13	6,750		80		5	24	14						3,000		150	7	1	20,800		100	0	0
14	6,265		75		5	22	15						2,600		90	3	0	4,600		550	0	0
15	6,210		80		5	23	11						100				2	1,000				0
16	5,670																					
17	6,905		65		5	18	12						400		180	2	0	4,400		550		0
18	6,880		80		5	17	11						4,000		120	2	2	6,400		100	2	0
19	6,900		140		7	17	17						100		120	3	4	20,800		500	2	0
20	6,430		110		15	17	18									8	2	28,000		550	4	0
21	6,350		90		7	22	19						800		140	1	0	4,600		100	0	0
22	6,200		70		7	25	21											6,400				0
23	5,310																					
24	5,150		50		7	30	21											8,200				0
25	3,980																					
26	5,890		50		8	30	21								2,200	25	1	44,200		100		0
27	5,240		80		5	29									180	3	0	8,200		100	6	0
28	5,580		75		5	30	21						1,000		140	0	0	2,800		100	2	0
29	5,200		80		7	30	21											46,000				0
30	4,325																					
31	5,350		70		12	26	11								250	4		22,600		550	0	0
Mean	5,875		81		7	29	22						3,900		332	7	1	15,800		274	2.4	0

Jan., 1924																						
1	4,795																					
2	5,530		65		10	25	17						800		130	1	1	2,800		1,000	8	0
3	5,625		110		15	26	20						5,000		250	0	0	24,400		1,000	6	0
4	5,485		150		10	25	13						1,700		300	6	0	40,600		100	0	0
5	5,540		110		18	25	17						10,000				0	8,200				0
6	4,745																					
7	6,320		150		30	25	18						5,500		300	2	1	6,400		50	4	0
8	5,610		150		20	25	17						3,800		550	5	0	44,200		10	2	0
9	6,640		100		20	27	15						500		120	6	1	6,400		100	2	0
10	6,225		120		20	29	17						600			4	1	26,200		1,000	2	0
11	5,320		110		25	25	14						800		150	1	1	24,400		550	0	0
12	5,105		150		20	20	14											10,000				0
13	5,275																					
14	5,740		200		25	27	16						7,500		450	10	1	2,800		550	2	0
15	5,590		220		30	24	16						8,000		180	15	2	46,000		1,000	6	0
16	5,640		190		25	25	14						7,400		130	0	2				0	0
17	5,590		250		50	17	15						3,500		300	10	2	8,200		550	8	0
18	5,550		300		20	20	10						3,500		100	3	0	4,600		100	2	0
19	5,820		250		25	24	10						8,800				29	62,200				0
20	5,600		230		17	18	7						5,500				0	10,000				0
21	6,230		200		25	17	6						1,000		250	9	6	20,800		10	0	0
22	6,500		150		20	18	5						1,000		150	4	0	28,000				0
23	6,215		120		20	17	7						6,700		200	1	3	28,000		10	0	0
24	5,790		120		30	17	7						8,300		50	16	1	46,000		50	0	0
25	5,835		275		30	15	10						1,700		200	7	1	26,200		50	0	0
26	6,330		130		25	17	6						8,000				0	28,000				0
27	6,375		120		17	18	8										1					0
28	6,305		150		25	22	10						2,400		900	8	1	46,000		550	0	0
29	6,350		110		25	20	9						1,400		250	10	3	28,000		100	0	0
30	5,880		130		25	20	10						3,600		500	29	8	28,000		1,000	10	0
31	5,810		100		30	20	6						4,000		200	48	2	8,200		100	6	0
Mean	5,790		160		23	22	12						4,300		270	8.9	2.5	30,700		394	2.9	0
Feb., 1924																						
1	5,700		110		30	19	10						3,600		180	6	1	8,200		50	0	0
2	5,610		100		30	20	8											22,600				0
3	4,560																					
4	6,620		60		25	21	11						1,000		150	16	4	2,800		50	4	0
5	6.290		75		23	24	10						800		130	3	1	4,600		100	2	0
6	5,610		120		30	24	18						2,500		600	10	0	44,200		1,000	6	0
7	5,830		100		20	28	18						1,200		180	2	1	28,000		50	4	0
8	6,020		120		25	25	20						2.700		120	2	0	10,000		50	2	0
9	5,350		140		25	27	15											26,200				0
10	4,135																					
11	6,360		110		25	28	16								150	14		8,200		100	4	0
12	5,795																					
13	6,150		100		20	27	14						1,000		200	4	1	4,600		50	0	0
14	6,150		100		25	25	14						1,000		300	3	0	4,600		1,000	0	0
15	5,160		90		25	25	13						800		150	0	1	2,800		50	0	0

Summary of daily laboratory results reported from each individual plant, located elsewhere than on the Ohio River, included in the survey of 1923–24—Continued

CHESTER (PA.) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Feb., 1924	*1,000 gallons*	° *C.*																				
16	5,755	------	140	------	20	24	14	------	------	------	------	------	------	------	------	------	------	42,200	------	------	------	0
17	4,840	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
18	5,750	------	100	------	------	18	------	------	------	------	------	------	800	------	180	1	1	2,800	------	50	0	0
19	5,645	------	100	------	25	28	13	------	------	------	------	------	100	------	200	6	3	28,000	------	550	0	0
20	5,075	------	90	------	17	30	20	------	------	------	------	------	4,600	------	300	4	18	2,800	------	550	4	0
21	5,610	------	160	------	25	25	13	------	------	------	------	------	------	------	190	10	------	42,400	------	550	0	0
22	6,290	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
23	4,835	------	100	------	25	28	20	------	------	------	------	------	12,000	------	------	------	1	10,000	------	------	------	0
24	4,620	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
25	6,300	------	90	------	17	29	18	------	------	------	------	------	3,600	------	110	2	0	4,400	------	50	0	0
26	5,180	------	75	------	15	29	18	------	------	------	------	------	2,800	------	220	0	4	2,800	------	550	0	0
27	5,140	------	75	------	------	33	19	------	------	------	------	------	6,700	------	150	1	1	6,400	------	550	2	0
28	5,650	------	70	------	20	30	18	------	------	------	------	------	1,200	------	100	2	3	6,400	------	10	0	0
29	5,230	------	70	------	15	30	20	------	------	------	------	------	900	------	150	2	1	28,000	------	1,000	0	0
Mean	5,560	------	100	------	23	28	15	------	------	------	------	------	2,570	------	198	4.6	2.3	18,100	------	335	1.5	0
March, 1924																						
1	5,200	------	75	------	------	30	------	------	------	------	------	------	------	------	------	------	------	46,000	------	------	------	0
2	4,780	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
3	5,560	------	60	------	18	29	24	------	------	------	------	------	1,500	------	100	7	8	4,600	------	50	8	0
4	5,745	------	60	------	20	35	25	------	------	------	------	------	1,800	------	200	4	3	24,400	------	1,000	8	0
5	4,600	------	55	------	18	32	23	------	------	------	------	------	4,800	------	------	7	5	2,800	------	------	4	0
6	5,285	------	55	------	18	35	24	------	------	------	------	------	3,300	------	120	18	2	8,200	------	550	10	0
7	4,900	------	85	------	15	35	24	------	------	------	------	------	600	------	200	3	0	8,200	------	100	8	0
8	5,105	------	150	------	15	35	24	------	------	------	------	------	------	------	------	------	------	8,200	------	------	------	0
9	4,215	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
10	5,305	------	140	------	15	35	21	------	------	------	------	------	2,000	------	100	1	1	20,800	------	550	2	0
11	5,350	------	150	------	20	35	23	------	------	------	------	------	6,000	------	------	2	1	4,600	------	------	2	0
12	6,080	------	130	------	20	28	22	------	------	------	------	------	1,400	------	100	1	0	26,200	------	550	8	0

13	5,125		120		20	30	24						1,000		50	1	0	26,200		1,000	2	0
4	4,755		130		20	29	23						800		150	1	0	26,200		550	6	0
15	5,120		140			30												26,200				0
16	4,580																					
17	5,350		140		15	30	16						200		350	1	0	20,800		50	0	0
18	4,820		170		5	31	17						2,800		80	3	1	6,400		50	0	0
19	5,540		85		2	30	18						8,300		150	3	1	6,400		50	0	0
20	5,070		110		8	30	23						6,300		130	1	0	6,400		100	0	0
21	4,620		100		15	33	23						2,600		80	7	0	8,200		50	0	0
22	4,660		100		15	29	23											42,400				0
23	3,965																					
24	5,425		65		15	29	25						6,700		100	5	0	42,400		1,000	8	0
25	5,170		75		15	34	23						1,000		70	3	1	20,800		50	0	0
26	4,565		60		15	32	24						1,100		70	1	1	24,400		100	6	0
27	4,965		65		18	33	22						500		1,100	0	0	8,200		100	10	0
28	5,295		60		15	34	22						500		120	1	2	4,400		550	4	0
29	4,705		50		5	33	21											6,400				0
30	4,330																					
31	4,955		40			31							700		80	0	1	24,400		550	4	0
Mean	5,010		95		15	32	22						2,570		176	3.3	1.3	17,500		368	4.3	0
Apr., 1924																						
1	4,985		40		10	30	24						3,800		100	2	0	4,600		550	2	0
2	5,240		70		2	30	23						800		130		1	5.500		100	0	0
3	4,900		90		15	30	20						2,800		50	1	0	28,000		100	4	0
4	5,030		90		15	29	20						2,400		110		0	8,200		100		0
5	4,930		85		10	26	18									3		8,200			4	0
6	4,380																					
7	4,570		150		15	23	18						800		150	1	3	64,000		550	2	0
8	5,890		300		15	24	19						2,400		120	2	0	6,400		10	8	0
9	4,550		200		18	25	15						30,000		200	2	0	20,800		50	0	0
10	4,950		160		15	17	10						16,000		100	0	0	22,600		50	0	0
11	4.730		120		15	16	10						2,200		100		0	24,100		500		0
12	4,910		95		15	17	9									2		24,400			0	0
13	4,075																					
14	5,350		70		15	13	8						1,000		50	2	0	1,000		10	0	0
15	5,675		55		15	12	9						1,000		120	2	0	1.000		10	2	0
16	5,105		75		10	17	10						800		60	1	1	2,800		50	0	0
17	5.065		80		10	23	10						200		30	40	3	8,200		100	2	0
18	4,300																					
19	5,115		100		15	24	16									2		64,000			4	0
20	3,795																					
21	4,680		90		5	24	15						800		100	2	0	4,600		550	2	0
22	4,840		65		10	24	15						2,200		50	1	0	2,800		50		0
23	4,850		65		5	20	14						900		120	3	0	2,800		550	4	0
24	4,920		75		10	25	11						2,000		100	1	0	8,200		1,000	4	0
25	5,070		80		5	23	15						9,000		130	3	0	24,400		100	0	0
26	4,550		60		10	21	14											4,600				0
27	4,210																					

Summary of daily laboratory results reported from each individual plant, located elsewhere than on the Ohio River, included in the survey of 1923–24—Continued

CHESTER (PA.) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
April, 1924	*1,000 gallons*	*° C.*																				
28	4,990		80		5	23	13						8,000		100	2	4	4,100		10	2	0
29	5,410		55		5	23	13						800		40	1	0	2,600		50	0	0
30	4,930		70		5	23	13						900		50	0	1	6,100		1,000	0	0
Mean	4,870		96		10	22	14						4,200		95	3.7	0.6	14,200		261	1.9	0
May, 1924																						
1	4,400		50		8	20	15						4,500		300	0	1	6,000		550	2	0
2	4,730		50		5	25	14						9,600		1,400		1	10,000		1,000		0
3	4,500		50		5	28	15						9,800			1	1	26,200			2	0
4	4,580																					
5	3,980		40		5	28	18						3,100		170	14	2	6,400		100	6	0
6	5,920		50		8	30	19						9,000		400	2	2	2,800		1,000	6	0
7	4,675		50		10	29	20						4,400		700	5	3	26,200		1,000	4	0
8	4,335		50		5	30	18						1,500		200		0			100		0
9	4,865		50		7	30	19						1,500		200		0	10,000		1,000	8	0
10	4,890		60		7	26	20									3		44,200			8	0
11	3,525																					
12	4,760		40		5	30	24						4,400		150	1	1	60,400		50	4	0
13	5,390		40		5	32	27						600		30	2	0	4,600		1,000	6	0
14	4,840		40		10	29	20						1,100		550	7	0	24,400		1,000	4	0
15	4,500		70		8	30	18						5,800		375	7	0	24,400		1,000	6	0
16	4,580		75		8	25	13						4,400		200		0	24,400		550		0
17	4,535		70		5	25	15									14		46,000			2	0
18	4,015																					
19	4,910		45		10	21	15						86,000		300	5	0	4,600		1,000	6	0
20	4,680		45		8	20	17						Spr.		1,400		1	24,400		1,000	0	0
21	4,640		40			22							8,600		550		1	10,000		1,000		0
22	4,840		40		5	24	14						5,800		600	5	2	10,000		1,000	2	0
23	4,730		45			25							5,800		400		2	10,000		550		0
24	4,040		45		10	24	14									6		10,000			2	0

25	6,175	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
26	4,025	......	50	......	5	22	20	......	......	......	......	......	9,600	......	100	4	1	5,500	......	1,000	6	0
27	4,210	......	50	......	15	26	24	......	......	......	......	......	2,000	......	500	12	1	800	......	1,000	0	0
28	4,990	......	75	......	10	25	20	......	......	......	......	......	14,000	......	240	4	0	20,800	......	1,000	4	0
29	5,410	......	65	......	5	30	19	......	......	......	......	......	......	......	......	36	......	82,000	......	......	4	0
30	4,306	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
31	4,900	......	65	......	......	31	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Mean	,0447	......	52	......	7	26	18	......	......	......	......	......	10,000	......	450	7	0.9	20,600	......	784	4.1	0
June, 1924																						
1	3,885	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
2	4,450	......	45	......	3	30	24	......	......	......	......	......	4,400	......	80	8	0	5,500	......	......	6	0
3	4,560	......	45	......	5	31	21	......	......	......	......	......	3,300	......	80	11	0	6,400	......	1,000	8	0
4	4,610	......	35	......	5	30	23	......	......	......	......	......	8,600	......	350	30	1	22,600	......	500	6	0
5	4,650	......	35	......	2	30	20	......	......	......	......	......	2,300	......	350	28	1	6,400	......	100	0	0
6	5,120	......	35	......	5	30	20	......	......	......	......	......	2,400	......	140	......	0	24,400	......	100	......	0
7	5,340	......	35	......	5	31	22	......	......	......	......	......	......	......	......	25	......	6,400	......	......	8	0
8	3,560	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
9	4,210	......	50	......	3	30	21	......	......	......	......	......	1,200	......	650	4	0	6,400	......	1,000	8	0
10	5,270	......	40	......	3	30	21	......	......	......	......	......	18,000	......	800	12	3	3,250	......	......	4	0
11	5,090	......	25	......	2	30	20	......	......	......	......	......	3,000	......	100	15	1	4,600	......	550	6	0
12	4,420	......	25	......	2	31	27	......	......	......	......	......	2,800	......	80	25	0	24,400	......	1,000	8	0
13	4,460	......	30	......	2	30	22	......	......	......	......	......	3,200	......	250	350	1	24,400	......	......	......	0
14	4,670	......	35	......	3	35	32	......	......	......	......	......	......	......	......	......	......	28,000	......	......	10	0
15	4,220	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
16	4,700	......	25	......	3	35	30	......	......	......	......	......	2,800	......	600	15	0	42,400	......	100	4	0
17	4,740	......	30	......	3	35	31	......	......	......	......	......	3,800	......	200	14	0	6,700	......	......	10	2
18	4,885	......	25	......	2	44	34	......	......	......	......	......	2,400	......	300	20	0	10,000	......	550	4	0
19	5,175	......	25	......	5	41	32	......	......	......	......	......	2,300	......	500	34	0	44,200	......	1,000	10	0
20	4,690	......	40	......	5	45	30	......	......	......	......	......	8,000	......	600	2	0	28,000	......	1,000	......	0
21	4,680	......	50	......	4	45	29	......	......	......	......	......	......	......	......	......	......	8,200	......	......	4	0
22	3,605	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
23	5,450	......	35	......	3	45	35	......	......	......	......	......	3,500	......	170	7	1	2,000	......	100	6	0
24	5,600	......	25	......	3	42	32	......	......	......	......	......	1,800	......	300	12	0	2,000	......	10	10	0
25	5,530	......	35	......	......	41	......	......	......	......	......	......	1,100	......	......	5	0	800	......	......	10	0
26	5,125	......	40	......	5	43	40	......	......	......	......	......	1,000	......	1,400	45	0	1,000	......	1,000	6	0
27	5,110	......	55	......	5	44	35	......	......	......	......	......	1,000	......	2,000	190	1	20,800	......	1,000	......	0
28	4,610	......	40	......	3	41	35	......	......	......	......	......	15,000	......	......	......	0	10,000	......	......	10	0
29	3,570	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
30	5,800	......	65	......	3	46	31	......	......	......	......	......	3,000	......	250	34	3	4,600	......	1,000	8	0
Mean	4,730	......	37	......	4	37	26	......	......	......	......	......	4,300	......	450	18	0.6	13,700	......	626	7	0.1
July, 1924																						
1	5,260	......	70	......	3	45	25	......	......	......	......	......	3,200	......	240	7	0	28,000	......	100	8	0
2	5,200	......	40	......	2	50	35	......	......	......	......	......	4,300	......	300	......	0	10,000	......	100	......	0
3	5,130	......	40	......	3	43	33	......	......	......	......	......	......	......	......	80	......	28,000	......	......	10	0
4	3,940	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
5	3,770	......	35	......	3	45	34	......	......	......	......	......	......	......	......	120	......	28,000	......	......	10	0
6	3,400	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......

Summary of daily laboratory results reported from each individual plant, located elsewhere than on the Ohio River, included in the survey of 1923–24—Continued

CHESTER (PA.) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
July, 1924	*1,000 gallons*	*° C.*																				
7	5,745	------	35	------	3	40	32	------	------	------	------	------	1,500	------	250	400	3	4,400	------	100	8	0
8	5,900	------	45	------	3	40	30	------	------	------	------	------	1,200	------	300	45	0	22,600	------	1,000	8	0
9	5,260	------	80	------	3	40	33	------	------	------	------	------	8,600	------	400	55	0	10,000	------	1,000	10	0
10	5,590	------	50	------	4	40	35	------	------	------	------	------	3,000	------	2,000	40	0	22,600	------	1,000	10	0
11	5,230	------	50	------	3	45	35	------	------	------	------	------	8,400	------	5,000	------	1	28,000	------	1,000	------	0
12	4,890	------	60	------	4	45	35	------	------	------	------	------	18,000	------	------	------	0	28,000	------	------	10	0
13	4,195	------	------	------	------	------	------	------	------	------	------	------	------	------	------	5,000	0	------	------	------	10	0
14	5,590	------	60	------	3	45	37	------	------	------	------	------	5,600	------	450	------	0	28,000	------	1,000	------	0
15	5,600	------	50	------	3	46	36	------	------	------	------	------	4,000	------	300	400	0	8,200	------	1,000	8	0
16	5,780	------	35	------	3	43	35	------	------	------	------	------	7,200	------	500	20	0	64,000	------	1,000	10	0
17	5,790	------	40	------	3	47	35	------	------	------	------	------	15,000	------	1,800	600	4	46,000	------	------	8	0
18	5,290	------	35	------	3	45	35	------	------	------	------	------	8,700	------	400	------	1	4,600	------	1,000	------	0
19	4,250	------	35	------	3	40	35	------	------	------	------	------	------	------	------	1,200	------	8,200	------	------	10	0
20	3,480	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
21	6,560	------	35	------	------	46	------	------	------	------	------	------	3,500	------	------	700	0	------	------	------	8	0
22	5,730	------	35	------	4	42	31	------	------	------	------	------	3,200	------	80	700	5	22,600	------	100	8	0
23	5,090	------	200	------	------	42	25	------	------	------	------	------	6,400	------	2,000	3,700	0	44,200	------	100	10	0
24	5,810	------	50	------	2	40	31	------	------	------	------	------	------	------	850	40	0	2,800	------	550	6	0
25	5,470	------	35	------	2	40	30	------	------	------	------	------	5,900	------	80	40	2	6,400	------	550	8	0
26	4,970	------	40	------	2	41	31	------	------	------	------	------	6,000	------	30	500	15	6,400	------	1,000	10	0
27	3,685	------	35	------	------	40	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
28	5,995	------	35	------	------	46	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
29	6,280	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
30	5,480	------	35	------	2	49	38	------	------	------	------	------	------	------	------	------	------	6,000	------	1,000	------	0
31	5,610	------	30	------	2	42	34	------	------	------	------	------	500	------	120	16	5	2,800	------	550	10	0
Mean	5,760	------	50	------	3	43	33	------	------	------	------	------	6,000	------	850	750	2	19,900	------	675	9	0
Aug., 1924																						
1	5,230	------	35	------	------	45	------	------	------	------	------	------	800	------	------	6	0	2,000	------	------	10	0
2	4,490	------	40	------	------	48	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------

3	4, 130	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
4	3, 980	......	40	......	2	44	28	......	......	......	......	......	600	......	80	60	0	4, 600	......	100	10	0
5	2, 235	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
6	6, 410	......	45	......	2	40	35	......	......	......	......	......	5, 000	......	275	30	0	4, 600	......	1, 000	10	0
7	6, 670	......	55	......	2	41	32	......	......	......	......	......	500	......	300	150	0	6, 400	......	1, 000	10	0
8	5, 920	......	35	......	3	40	35	......	......	......	......	......	1, 000	......	450	200	0	26, 200	......	550	10	0
9	4, 465	......	55	......	3	43	31	......	......	......	......	......	......	......	......	......	......	4, 600	......	......	......	0
10	5, 670	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
11	5, 610	......	45	......	3	44	34	......	......	......	......	......	1, 800	......	200	100	10	6, 400	......	550	10	0
12	4, 510	......	65	......	8	43	34	......	......	......	......	......	9, 500	......	100	10	0	64, 000	......	1, 000	10	0
13	7, 000	......	35	......	3	42	35	......	......	......	......	......	3, 500	......	400	80	0	800	......	1, 000	10	0
14	6, 500	......	35	......	3	43	34	......	......	......	......	......	43, 000	......	100	50	35	64, 000	......	1, 000	10	0
15	2, 300	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
16	5, 790	......	35	......	3	47	35	......	......	......	......	......	......	......	......	......	......	22, 600	......	......	......	0
17	5, 590	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
18	5, 190	......	35	......	3	50	37	......	......	......	......	......	4, 000	......	700	100	8	22, 600	......	1, 000	10	0
19	5, 300	......	35	......	3	48	38	......	......	......	......	......	2, 400	......	1, 000	70	0	46, 000	......	550	10	0
20	5, 120	......	35	......	3	47	35	......	......	......	......	......	7, 500	......	1, 000	300	1	28, 000	......	1, 000	10	0
21	6, 160	......	40	......	......	47	......	......	......	......	......	......	7, 800	......	......	......	2	7, 750	......	......	......	0
22	5, 860	......	30	......	3	46	37	......	......	......	......	......	1, 500	......	1, 000	3,000	0	44, 200	......	1, 000	10	0
23	5, 870	......	30	......	......	45	......	......	......	......	......	......	900	......	......	......	4	4, 600	......	......	......	0
24	5, 855	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
25	5, 920	......	40	......	......	45	......	......	......	......	......	......	1, 500	......	......	......	0	24, 400	......	......	......	10
26	6, 030	......	100	......	3	44	40	......	......	......	......	......	16, 000	......	400	60	5	55, 000	......	550	10	0
27	3, 685	......	55	......	2	50	37	......	......	......	......	......	12, 000	......	120	20	1	28, 000	......	550	10	0
28	5, 995	......	50	......	2	47	37	......	......	......	......	......	8, 300	......	600	100	14	64, 000	......	1, 000	10	0
29	6, 280	......	45	......	2	51	38	......	......	......	......	......	1, 700	......	1, 000	50	2	32, 500	......	......	10	0
30	5, 480	......	40	......	2	49	38	......	......	......	......	......	8, 000	......	......	50	8	46, 000	......	......	10	2
31	5, 610	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	4	......	......	......	10	4
Mean	5, 320	......	44	......	3	46	35	......	......	......	......	......	6, 500	......	485	245	4	26, 500	......	790	10	0. 7
Sept., 1924																						
1	4, 200	......	110	......	2	......	36	......	......	......	......	......	......	......	......	0	1	8, 200	......	......	8	0
2	5, 805	......	40	......	2	54	45	......	......	......	......	......	4, 000	......	......	30	0	64, 000	......	......	10	0
3	5, 935	......	45	......	2	54	38	......	......	......	......	......	2, 500	......	250	75	8	55, 000	......	550	10	0
4	5, 910	......	45	......	2	50	38	......	......	......	......	......	1, 800	......	700	80	0	8, 200	......	......	8	0
5	5, 850	......	45	......	3	48	37	......	......	......	......	......	1, 800	......	600	100	1	8, 200	......	1, 000	10	0
6	4, 830	......	45	......	3	50	44	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
7	4, 970	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
8	4, 690	......	65	......	3	48	45	......	......	......	......	......	4, 800	......	2, 400	100	5	......	......	......	10	0
9	6, 170	......	55	......	2	46	40	......	......	......	......	......	1, 000	......	100	80	1	28, 000	......	1, 000	10	0
10	5, 840	......	65	......	2	53	40	......	......	......	......	......	5, 200	......	300	220	0	100, 000	......	1, 000	10	0
11	4, 800	......	65	......	2	54	42	......	......	......	......	......	2, 000	......	350	250	0	4, 600	......	1, 000	10	0
12	4, 530	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
13	5, 700	......	50	......	......	50	......	......	......	......	......	......	14, 000	......	......	......	0	8, 200	......	......	......	0
14	3, 010	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
15	6, 570	......	45	......	3	50	40	......	......	......	......	......	3, 000	......	700	80	0	4, 600	......	1, 000	10	0
16	5, 020	......	50	......	3	52	43	......	......	......	......	......	1, 800	......	1, 000	10	1	30, 300	......	1, 000	8	0
17	5, 350	......	50	......	3	55	47	......	......	......	......	......	3, 600	......	2, 000	250	1	8, 200	......	1, 000	10	0
18	4, 020	......	50	......	3	54	45	......	......	......	......	......	12, 000	......	500	80	0	28, 000	......	1, 000	10	0
19	5, 210	......	50	......	2	50	35	......	......	......	......	......	3, 100	......	......	......	2	8, 200	......	......	......	0

Summary of daily laboratory results reported from each individual plant, located elsewhere than on the Ohio River, included in the survey of 1923–24—Continued

CHESTER (PA.) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Oct., 1924	*1,000 gallons*	*° C.*																				
20	5,020		45			50												100,000				
21	4,110																					
22	4,740		35		2	48	33						2,500		7,000	40	0	5,000			10	0
23	4,930		65		2	50	40						6,300		1,200	950	1	20,200		550	8	0
24	5,460		110		4	48	39						1,000		600	425	3	8,200		550	10	0
25	4,770		100		2	49	42						1,200		40	0	4				10	0
26	4,720		70		2	50	41						3,500		120	0	0	8,200		1,000	10	0
27	5,080		60		2	49	38															0
28	4,090																					
29	4,595		45		2	47	41						2,200		1,300	40	0	10,000		1,000	8	0
30	4,755		60		2	45	35								8,400	275		64,000		1,000	10	0
Mean	5,020		59		2	50	42						3,900		1,400	160	1.3	27,600		904	9.5	0

ELMIRA (N. Y.) WATER FILTRATION PLANT

Day	Volume of water treated	Water temperature	Turbidity Raw	Turbidity Primary settled	Turbidity Applied to filters	Alkalinity Raw	Alkalinity Applied to filters	48 hr. Raw	48 hr. Primary settled	48 hr. Applied to filters	48 hr. Filtered, unchlorinated	48 hr. Filtered, chlorinated	24 hr. Raw	24 hr. Primary settled	24 hr. Applied to filters	24 hr. Filtered, unchlorinated	24 hr. Filtered, chlorinated	B. coli Raw	B. coli Primary settled	B. coli Applied to filters	B. coli Filtered, unchlorinated	B. coli Filtered, chlorinated
Nov., 1923																						
1	5,320	9	12			89		2,200			1	16						100			0	0
2	5,270	9	12			89		1,400			2	10						100			0	0
3	5,520	12	12			89		4,600			1	4						397			0	0
4	5,110	11	12			91		8,200			4	5						1,000			0	0
5	6,160	11	12			86		2,100			3	3						1,000			0	0
6	5,220	10	12			88		8,300			5	6						40			0	0
7	6,050	12	12			92		12,100			3	4						20			0	0
8	5,530	11	12			92		12,400			10	5						1,000			0	0
9	5,100	12	18			93		6,300			1	2						100			0	0
10	5,300	12	18			93		3,300			1	7						670			0	0
11	6,250	11	18			92		4,800			5	6						703			0	0
12	5,230	13	15			85		4,500			3	7						703			0	0

13	5,330	11	15			79		6,200			4	4						1,000			0	0
14	5,140	11	10			85		2,600			2	2						1,000			0	0
15	5,840	11	12			87		3,300			4	7						703			0	0
16	6,030	12	12			87		2,200			3	6						1,000			0	0
17	4,700	12	12			87		1,700			1	9						1,000			0	0
18	5,030	12	12			88		7,400			1	4						1,000			0	0
19	6,170	13	12			88		8,400			19	8						703			0	0
20	6,000	13	12			88		5,300			1	9						357			0	0
21	5,080	13	10			88		5,000			13	12						20			0	0
22	5,060	8	10			89		4,400			1	11						40			0	0
23	6,020	6	10			92		2,400			2	3						40			0	0
24	6,240	4	10			92		1,500			9	12						377			0	0
25	5,000	4	10			93		3,400			5	8						703			0	0
26	5,040	4	10			93		3,800			13	5						1,000			0	0
27	6,110	5	10			94		4,200			1	11						703			0	0
28	5,210	6	10			95		8,900			1	13						703			0	0
29	5,310	6	10			95		5,100			5	5						703			0	0
30	[1] 6,040	6	20			40		6,300			1	6						80			0	0
Mean	5,524	10	12			88		5,080			4.2	7.3						566			0	0
Dec., 1933																						
1	[1] 5,380	6	20			100		8,400			1	3						1,000			0	4
2	[1] 5,120	6	25			70		21,800			44	40						1,000			0	0
3	[1] 5,410	6	20			73		48,600			9	44						1,000			0	0
4	[1] 5,710	6	20			68		36,000			9	6						1,000			0	0
5	[1] 6,060	6	20			39		14,100			1	11						100			0	0
6	[1] 5,200	6	60			37		14,400			4	8						670			0	0
7	[1] 6,050	6	40			37		16,000			3	15						1,000			0	0
8	[1] 4,930	6	50			35		18,000			2	7						683			0	0
9	[1] 5,740	6	30			35		12,500			80	14						683			0	0
10	[1] 4,330	6	40			45		6,200			2	14						683			0	0
11	[1] 5,680	6	40			44		5,100			2	24						683			0	0
12	[1] 6,480	6	40			44		2,100			4	3						377			0	0
13	[1] 6,410	6	30			44		1,250			1	19						1,000			0	0
14	[1] 6,370	6	20			37		900			3	7						100			0	0
15	[1] 5,300	6	20			37		4,300			40	23						40			0	0
16	[1] 5,630	4	20			37		800			12	42						703			0	0
17	[1] 6,030	4	20			37		1,200			20	12						357			0	0
18	[1] 6,120	4	20			55		1,600			7	23						357			0	0
19	[1] 6,340	4	20			57		5,500			4	8						683			0	0
20	5,160	4	15			59		10,500			8	16						1,000			0	0
21	5,290	4	15			59		6,400			3	12						1,000			0	0
22	[1] 6,180	5	15			61		4,200			4	16						703			0	0
23	[1] 5,890	5	15			62		6,800			14	6						1,000			0	0
24	[1] 4,880	5	15			62		3,700			10	4						1,000			0	0
25	[1] 5,920	5	15			32		4,300			3	6						80			0	0
26	[1] 5,280	4	20			29		4,200			5	5						330			0	0
27	[1] 4,880	4	15			28		4,400			2	8						377			0	0
28	[1] 6,000	4	15			28		3,000			2	6						40			0	0

[1] Impounded supply used, in whole or in part.

Summary of daily laboratory results reported from each individual plant, located elsewhere than on the Ohio River, included in the survey of 1923–24—Continued

ELMIRA (N. Y.) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m)		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Dec., 1923	*1,000 gallons*	° *C.*																				
29	[1] 6,000	3	15	------	------	26	------	4,000	------	------	1	3	------	------	------	------	------	337	------	------	0	0
30	[1] 5,240	3	15	------	------	28	------	5,000	------	------	1	1	------	------	------	------	------	40	------	------	0	0
31	[1] 5,910	3	15	------	------	28	------	2,100	------	------	2	8	------	------	------	------	------	40	------	------	0	0
Mean	5,640	5	24	------	------	46	------	8,950	------	------	9.8	13	------	------	------	------	------	582	------	------	0	0.13
Jan., 1924																						
1	[1] 5,690	3	100	------	------	26	------	23,000	------	------	2	------	------	------	------	------	------	40	------	------	0	0
2	[1] 4,890	3	100	------	------	26	------	15,300	------	------	4	------	------	------	------	------	------	20	------	------	0	0
3	[1] 5,850	3	75	------	------	26	------	9,700	------	------	7	------	------	------	------	------	------	20	------	------	0	0
4	[1] 5,900	3	60	------	------	26	------	12,200	------	------	6	------	------	------	------	------	------	0	------	------	0	0
5	[1] 5,460	5	75	------	------	50	------	24,000	------	------	3	------	------	------	------	------	------	337	------	------	0	0
6	[1] 4,700	5	75	------	------	50	------	42,000	------	------	15	------	------	------	------	------	------	40	------	------	0	0
7	[1] 6,340	3	75	------	------	50	------	18,000	------	------	4	------	------	------	------	------	------	1,000	------	------	0	0
8	[1] 6,300	2	50	------	------	50	------	22,000	------	------	1	------	------	------	------	------	------	1,000	------	------	0	0
9	5,120	3	25	------	------	50	------	25,600	------	------	4	------	------	------	------	------	------	1,000	------	------	0	0
10	[1] 5,610	3	25	------	------	51	------	17,800	------	------	16	------	------	------	------	------	------	397	------	------	0	0
11	[1] 5,380	3	125	------	------	44	------	21,000	------	------	33	------	------	------	------	------	------	703	------	------	0	0
12	[1] 5,590	3	200	------	------	23	------	41,000	------	------	10	------	------	------	------	------	------	703	------	------	0	2
13	[1] 5,750	3	200	------	------	24	------	62,000	------	------	7	------	------	------	------	------	------	1,000	------	------	0	0
14	[1] 5,790	3	150	------	------	35	------	53,000	------	------	14	------	------	------	------	------	------	397	------	------	0	0
15	[1] 6,190	3	100	------	------	41	------	23,000	------	------	9	------	------	------	------	------	------	397	------	------	0	0
16	[1] 5,530	3	75	------	------	41	------	31,800	------	------	11	------	------	------	------	------	------	703	------	------	0	0
17	[1] 6,020	4	125	------	------	26	------	17,300	------	------	1	------	------	------	------	------	------	397	------	------	0	0
18	[1] 6,120	4	200	------	------	21	------	25,000	------	------	5	------	------	------	------	------	------	1,000	------	------	6	4
19	[1] 5,150	4	300	------	------	20	------	34,000	------	------	2	------	------	------	------	------	------	1,000	------	------	0	0
20	[1] 6,030	3	300	------	------	21	------	22,000	------	------	14	------	------	------	------	------	------	703	------	------	0	0
21	[1] 5,670	3	50	------	------	33	------	15,200	------	------	7	------	------	------	------	------	------	1,000	------	------	0	0
22	[1] 6,190	2	30	------	------	36	------	10,300	------	------	4	------	------	------	------	------	------	1,000	------	------	0	0
23	5,240	2	30	------	------	38	------	18,400	------	------	1	------	------	------	------	------	------	703	------	------	6	0
24	[1] 6,300	2	20	------	------	39	------	8,500	------	------	15	------	------	------	------	------	------	1,000	------	------	4	0

25	5,210	2	20	------	------	46	------	16,400	------	------	5	------	------	------	------	------	------	1,000	------	------	0	0
26	5,100	2	20	------	------	47	------	16,100	------	------	3	------	------	------	------	------	------	1,000	------	------	0	2
27	[1]6,200	2	20	------	------	55	------	26,000	------	------	10	------	------	------	------	------	------	1,000	------	------	4	0
28	[1]5,600	2	20	------	------	63	------	22,000	------	------	5	------	------	------	------	------	------	1,000	------	------	0	0
29	[1]5,980	2	20	------	------	65	------	21,000	------	------	14	------	------	------	------	------	------	1,000	------	------	0	0
30	6,210	2	20	------	------	66	------	27,000	------	------	7	------	------	------	------	------	------	------	------	------	------	------
31	5,270	2	20	------	------	59	------	18,000	------	------	6	------	------	------	------	------	------	------	------	------	------	------
Mean	5,690	3	87	------	------	40	------	23,800	------	------	7.9	------	------	------	------	------	------	676	------	------	0.7	0.3
Feb., 1924																						
1	5,210	2	20	------	------	60	------	11,250	------	------	3	18	------	------	------	------	------	(2)	------	------	(2)	(2)
2	5,230	2	20	------	------	60	------	13,600	------	------	2	12	------	------	------	------	------	670	------	------	0	0
3	5,160	2	25	------	------	62	------	9,200	------	------	3	16	------	------	------	------	------	1,000	------	------	0	0
4	5,200	2	25	------	------	63	------	14,000	------	------	1	4	------	------	------	------	------	100	------	------	0	0
5	[1]6,090	2	25	------	------	63	------	12,500	------	------	4	2	------	------	------	------	------	1,000	------	------	0	0
6	[1]5,260	4	100	------	------	24	------	9,200	------	------	22	5	------	------	------	------	------	60	------	------	0	0
7	[1]5,950	4	100	------	------	24	------	13,200	------	------	4	7	------	------	------	------	------	40	------	------	0	0
8	[1]5,300	4	125	------	------	45	------	32,600	------	------	10	19	------	------	------	------	------	1,000	------	------	0	0
9	5,820	4	75	------	------	46	------	40,000	------	------	4	5	------	------	------	------	------	1,000	------	------	0	0
10	5,180	3	50	------	------	51	------	30,400	------	------	9	8	------	------	------	------	------	1,000	------	------	0	0
11	5,200	3	25	------	------	53	------	12,500	------	------	2	4	------	------	------	------	------	80	------	------	0	0
12	5,190	3	12	------	------	58	------	13,000	------	------	5	8	------	------	------	------	------	703	------	------	0	0
13	5,210	3	12	------	------	60	------	21,200	------	------	12	12	------	------	------	------	------	397	------	------	0	0
14	5,170	3	15	------	------	64	------	18,100	------	------	6	9	------	------	------	------	------	703	------	------	0	0
15	5,210	2	15	------	------	65	------	8,700	------	------	9	16	------	------	------	------	------	397	------	------	0	0
16	5,150	2	15	------	------	65	------	17,000	------	------	4	14	------	------	------	------	------	1,000	------	------	0	0
17	[1]6,100	2	15	------	------	70	------	14,000	------	------	7	8	------	------	------	------	------	703	------	------	0	0
18	4,930	2	15	------	------	76	------	9,600	------	------	5	15	------	------	------	------	------	703	------	------	0	0
19	5,140	2	20	------	------	72	------	6,800	------	------	2	23	------	------	------	------	------	1,000	------	------	0	0
20	5,000	2	20	------	------	73	------	6,500	------	------	5	10	------	------	------	------	------	703	------	------	0	0
21	5,210	2	20	------	------	81	------	7,200	------	------	3	6	------	------	------	------	------	703	------	------	0	0
22	[1]6,020	2	20	------	------	81	------	18,400	------	------	20	15	------	------	------	------	------	703	------	------	0	0
23	5,110	2	20	------	------	78	------	9,800	------	------	4	9	------	------	------	------	------	397	------	------	0	0
24	5,080	2	20	------	------	78	------	13,600	------	------	5	12	------	------	------	------	------	40	------	------	0	0
25	[1]6,080	2	20	------	------	79	------	15,100	------	------	7	7	------	------	------	------	------	377	------	------	0	0
26	5,060	2	20	------	------	79	------	6,000	------	------	16	19	------	------	------	------	------	397	------	------	0	0
27	[1]6,110	2	25	------	------	80	------	10,400	------	------	4	16	------	------	------	------	------	397	------	------	0	0
28	5,250	2	25	------	------	80	------	14,000	------	------	11	8	------	------	------	------	------	100	------	------	0	0
29	[1]6,190	2	20	------	------	80	------	11,200	------	------	6	19	------	------	------	------	------	397	------	------	0	0
Mean	5,420	2	32	------	------	64	------	14,450	------	------	6.7	11	------	------	------	------	------	555	------	------	0	0
March, 1924																						
1	5,850	2	20	------	------	80	------	6,000	------	------	14	19	------	------	------	------	------	40	------	------	0	0
2	5,040	2	20	------	------	75	------	14,000	------	------	10	6	------	------	------	------	------	60	------	------	0	0
3	5,470	2	25	------	------	75	------	11,000	------	------	10	9	------	------	------	------	------	397	------	------	0	0
4	[1]5,130	2	25	------	------	76	------	7,500	------	------	6	24	------	------	------	------	------	40	------	------	0	0
5	[1]5,480	3	75	------	------	27	------	49,000	------	------	10	17	------	------	------	------	------	377	------	------	0	0

[1] Impounded supply used, in whole or in part.

[2] Lost

Summary of daily laboratory results reported from each individual plant, located elsewhere than on the Ohio River, included in the survey of 1923–24—Continued

ELMIRA (N. Y.) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
March, 1924	*1,000 gallons*	*° C.*																				
6	[1] 5,180	4	100	------	------	22	------	73,000	------	------	38	42	------	------	------	------	------	703	------	------	0	0
7	[1] 5,660	4	100	------	------	21	------	46,000	------	------	70	12	------	------	------	------	------	357	------	------	0	0
8	[1] 5,280	4	100	------	------	21	------	32,600	------	------	14	19	------	------	------	------	------	683	------	------	0	0
9	[1] 6,570	4	75	------	------	21	------	26,500	------	------	4	8	------	------	------	------	------	80	------	------	0	0
10	[1] 5,200	4	75	------	------	21	------	26,600	------	------	7	5	------	------	------	------	------	40	------	------	0	0
11	[1] 4,870	4	60	------	------	23	------	31,200	------	------	5	14	------	------	------	------	------	397	------	------	0	0
12	5,200	5	50	------	------	24	------	22,100	------	------	40	52	------	------	------	------	------	40	------	------	0	0
13	[1] 5,540	5	50	------	------	25	------	20,500	------	------	6	17	------	------	------	------	------	20	------	------	0	0
14	[1] 5,470	5	50	------	------	25	------	18,400	------	------	7	9	------	------	------	------	------	20	------	------	0	0
15	5,290	5	50	------	------	25	------	21,000	------	------	9	6	------	------	------	------	------	40	------	------	0	0
16	[1] 5,310	5	50	------	------	25	------	17,600	------	------	20	12	------	------	------	------	------	20	------	------	0	0
17	5,200	5	50	------	------	25	------	23,000	------	------	14	19	------	------	------	------	------	0	------	------	0	0
18	[1] 5,320	5	50	------	------	25	------	26,000	------	------	5	7	------	------	------	------	------	0	------	------	0	0
19	[1] 5,410	4	100	------	------	25	------	48,000	------	------	12	9	------	------	------	------	------	1,000	------	------	0	0
20	[1] 6,060	4	60	------	------	52	------	11,600	------	------	6	5	------	------	------	------	------	1,000	------	------	0	0
21	4,870	4	60	------	------	54	------	21,600	------	------	4	15	------	------	------	------	------	1,000	------	------	0	0
22	4,990	4	150	------	------	53	------	19,800	------	------	3	19	------	------	------	------	------	1,000	------	------	0	0
23	5,350	4	150	------	------	43	------	16,700	------	------	5	12	------	------	------	------	------	1,000	------	------	0	0
24	[1] 4,810	4	400	------	------	29	------	36,000	------	------	21	4	------	------	------	------	------	670	------	------	0	0
25	[1] 5,340	4	125	------	------	24	------	31,000	------	------	5	3	------	------	------	------	------	703	------	------	0	0
26	[1] 5,270	4	125	------	------	26	------	37,000	------	------	9	15	------	------	------	------	------	670	------	------	0	0
27	5,300	4	125	------	------	26	------	17,600	------	------	32	8	------	------	------	------	------	337	------	------	0	0
28	[1] 5,170	4	125	------	------	25	------	10,300	------	------	6	4	------	------	------	------	------	670	------	------	0	0
29	5,000	4	400	------	------	24	------	47,100	------	------	10	6	------	------	------	------	------	337	------	------	0	0
30	[1] 5,000	4	400	------	------	24	------	25,100	------	------	8	28	------	------	------	------	------	1,000	------	------	0	0
31	[1] 5,290	4	300	------	------	24	------	10,300	------	------	8	5	------	------	------	------	------	708	------	------	0	0
Mean	5,320	4	114	------	------	34	------	26,580	------	------	13	11	------	------	------	------	------	432	------	------	0	0
April, 1924																						
1	[1] 5,900	4	250	------	------	24	------	11,000	------	------	7	20	------	------	------	------	------	60	------	------	0	0
2	[1] 5,510	4	200	------	------	24	------	6,200	------	------	9	10	------	------	------	------	------	357	------	------	0	0

3	[1] 5,160	4	150	------	------	24	------	1,700	------	------	7	14	------	------	------	------	------	100	------	------	0	0
4	[1] 5,050	5	300	------	------	24	------	2,200	------	------	5	4	------	------	------	------	------	397	------	------	2	2
5	[1] 4,870	5	600	------	------	20	------	5,900	------	------	7	12	------	------	------	------	------	337	------	------	0	0
6	[1] 5,050	5	1,000	------	------	21	------	13,000	------	------	15	10	------	------	------	------	------	357	------	------	0	0
7	[1] 4,990	5	300	------	------	20	------	10,700	------	------	11	12	------	------	------	------	------	670	------	------	0	0
8	[1] 5,540	5	300	------	------	20	------	6,700	------	------	8	9	------	------	------	------	------	683	------	------	0	0
9	[1] 5,650	6	180	------	------	22	------	5,600	------	------	7	6	------	------	------	------	------	40	------	------	0	0
10	[1] 5,430	6	60	------	------	22	------	2,800	------	------	15	5	------	------	------	------	------	20	------	------	0	0
11	[1] 5,150	6	60	------	------	21	------	1,900	------	------	8	4	------	------	------	------	------	40	------	------	0	0
12	[1] 5,140	6	70	------	------	20	------	2,400	------	------	6	2	------	------	------	------	------	397	------	------	0	0
13	[1] 5,110	7	70	------	------	21	------	1,600	------	------	1	1	------	------	------	------	------	0	------	------	0	0
14	[1] 5,130	9	60	------	------	21	------	2,000	------	------	4	7	------	------	------	------	------	20	------	------	0	0
15	[1] 5,120	8	60	------	------	19	------	2,200	------	------	5	6	------	------	------	------	------	20	------	------	0	0
16	[1] 5,130	7	60	------	------	20	------	3,000	------	------	4	5	------	------	------	------	------	20	------	------	0	0
17	[1] 5,530	7	60	------	------	20	------	1,700	------	------	1	4	------	------	------	------	------	0	------	------	0	0
18	[1] 5,690	7	100	------	------	20	------	11,000	------	------	11	9	------	------	------	------	------	40	------	------	0	0
19	[1] 4,640	8	700	------	------	18	------	24,500	------	------	9	10	------	------	------	------	------	80	------	------	0	0
20	[1] 5,000	8	125	------	------	18	------	10,500	------	------	15	16	------	------	------	------	------	80	------	------	0	0
21	[1] 5,020	8	125	------	------	22	------	5,200	------	------	3	8	------	------	------	------	------	20	------	------	0	0
22	[1] 5,000	8	150	------	------	22	------	1,900	------	------	1	6	------	------	------	------	------	20	------	------	0	0
23	[1] 5,180	7	100	------	------	21	------	950	------	------	3	14	------	------	------	------	------	40	------	------	0	0
24	[1] 5,410	8	100	------	------	20	------	2,100	------	------	4	5	------	------	------	------	------	40	------	------	0	0
25	[1] 5,000	8	75	------	------	20	------	2,200	------	------	4	2	------	------	------	------	------	20	------	------	0	0
26	[1] 4,800	8	60	------	------	22	------	1,600	------	------	2	6	------	------	------	------	------	60	------	------	0	0
27	[1] 5,010	8	60	------	------	21	------	2,800	------	------	8	12	------	------	------	------	------	377	------	------	0	0
28	[1] 4,770	8	60	------	------	20	------	6,300	------	------	24	20	------	------	------	------	------	60	------	------	0	0
29	[1] 5,580	8	50	------	------	21	------	5,400	------	------	7	18	------	------	------	------	------	683	------	------	0	0
30	[1] 6,070	8	50	------	------	21	------	3,900	------	------	2	6	------	------	------	------	------	40	------	------	0	0
Mean	5,220	7	184	------	------	20	------	5,300	------	------	7.1	8.8	------	------	------	------	------	169	------	------	0.07	0.07
May, 1924																						
1	[1] 5,420	8	30	------	------	21	------	10,400	------	------	4	3	------	------	------	------	------	60	------	------	0	0
2	[1] 5,080	8	100	------	------	51	------	5,700	------	------	1	7	------	------	------	------	------	100	------	------	0	0
3	[1] 5,060	8	60	------	------	50	------	6,300	------	------	4	14	------	------	------	------	------	397	------	------	0	0
4	5,130	8	50	------	------	51	------	3,000	------	------	7	12	------	------	------	------	------	397	------	------	0	0
5	4,800	9	40	------	------	51	------	8,100	------	------	15	40	------	------	------	------	------	397	------	------	0	0
6	5,310	12	30	------	------	53	------	4,500	------	------	2	16	------	------	------	------	------	1,000	------	------	0	0
7	5,260	13	10	------	------	52	------	8,400	------	------	36	30	------	------	------	------	------	1,000	------	------	0	0
8	5,390	15	15	------	------	50	------	6,600	------	------	7	18	------	------	------	------	------	397	------	------	0	0
9	[1] 5,850	11	15	------	------	51	------	5,100	------	------	5	6	------	------	------	------	------	397	------	------	0	0
10	[1] 5,550	11	30	------	------	24	------	12,800	------	------	3	5	------	------	------	------	------	397	------	------	0	0
11	[1] 5,030	12	40	------	------	24	------	15,000	------	------	7	8	------	------	------	------	------	60	------	------	0	0
12	[1] 5,080	12	250	------	------	23	------	28,000	------	------	14	4	------	------	------	------	------	683	------	------	0	0
13	[1] 5,050	12	200	------	------	23	------	10,200	------	------	5	7	------	------	------	------	------	1,000	------	------	0	0
14	[1] 5,030	12	100	------	------	22	------	12,700	------	------	9	4	------	------	------	------	------	397	------	------	0	0
15	[1] 5,360	12	100	------	------	24	------	11,600	------	------	4	15	------	------	------	------	------	1,000	------	------	0	0
16	[1] 5,090	13	75	------	------	25	------	5,400	------	------	6	9	------	------	------	------	------	1,000	------	------	0	0
17	[1] 5,010	13	60	------	------	25	------	8,400	------	------	7	16	------	------	------	------	------	703	------	------	0	0
18	[1] 5,570	13	50	------	------	25	------	6,600	------	------	5	12	------	------	------	------	------	703	------	------	0	0

[1] Impounded supply used, in whole or in part.

[2] Lost.

Summary of daily laboratory results reported from each individual plant, located elsewhere than on the Ohio River, included in the survey of 1923–24—Continued

ELMIRA (N. Y.) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
May, 1924	*1,000 gallons*	*° C.*																				
19	[1] 4,480	13	40			25		2,600			18	24						377			0	0
20	[1] 4,920	12	30			25		2,800			4	10						40			0	0
21	[1] 5,500	12	30			25		1,600			3	8						397			0	0
22	[1] 5,040	12	30			27		2,000			3	7						80			0	0
23	[1] 5,430	12	25			25		1,300			6	3						357			0	0
24	[1] 5,110	13	20			25		1,200			8	6						683			0	0
25	[1] 4,770	12	20			25		1,200			12	7						337			0	0
26	[1] 4,710	12	20			25		1,300			12	12						20			0	0
27	[1] 4,690	12	20			26		1,700			6	17						40			0	0
28	[1] 4,870	14	15			26		(2)			(2)	(2)						80			0	0
29	[1] 4,450	14	20			55		2,400			2	(2)						1,000			0	0
30	[1] 6,000	14	15			56		2,600			1	7						1,000			0	0
31	[1] 4,670	15	12			66		1,800			2	5						397			0	0
Mean	5,120	12	50			35		6,380			7.3	11						496			0	0
June, 1924																						
1	4,710	15	12			64		4,200			3	6						1,000			0	0
2	4,440	17	10			63		2,400			1	5						703			0	0
3	5,230	17	10			64		4,910			3	4						703			0	0
4	5,140	17	10			65		5,400			9	12						703			0	0
5	4,650	16	10			69		7,000			3	7						703			0	0
6	5,020	16	10			69		6,600			7	19						703			0	0
7	4,840	16	10			69		9,400			1	14						1,000			4	2
8	4,900	16	10			70		3,800			8	10						1,000			0	0
9	4,440	17	30			69		3,700			10	7						1,000			0	0
10	5,160	17	10			69		3,100			2	12						1,000			0	0
11	5,010	17	10			70		8,400			20	5						703			0	0
12	5,100	17	10			70		3,000			5	11						703			0	0
13	5,030	17	10			72		10,600			3	16						1,000			0	0

14	4,580	17	8			72		6,300			4	7						1,000			0	2
15	4,650	18	8			72		5,200			5	4						1,000			4	4
16	4,400	20	8			72		1,800			2	20						1,000			4	4
17	5,210	21	8			72		3,300			3	5						397			0	0
18	5,380	22	8			74		7,000			6	40						397			0	4
19	4,820	24	8			75		2,600			3	56						100			0	0
20	5,100	24	8			75		(2)			(2)	(2)						703			0	0
21	[1] 4,820	24	300			52		(2)			(2)	(2)						1,000			0	0
22	[1] 5,230	24	10			34		(2)			(2)	(2)						0			0	0
23	[1] 5,230	24	100			59		9,700			6	15						1,000			0	0
24	5,930	23	60			65		10,300			4	12						1,000			0	0
25	5,000	23	15			61		9,500			9	40						1,000			0	0
26	4,870	23	30			67		7,600			7	90						1,000			0	0
27	5,130	23	75			62		2,600			5	30						1,000			0	0
28	4,570	20	40			68		6,500			1	40						1,000			0	0
29	[1] 4,460	21	15			59		11,000			2	25						1,000			0	0
30	[1] 3,540	20	8			35		700			3	16						1,000			0	0
Mean	4,890	19	29			64		5,990			6	19						817			0.4	0.5
July, 1924																						
1	[1] 6,680	21	100			59		12,700			3	20						60			0	0
2	6,830	21	50			62		7,800			5	30						1,000			0	0
3	5,990	21	40			67		9,100			7	15						703			0	0
4	5,330	21	30			67		5,000			4	7						1,000			0	0
5	3,850	21	30			68		5,500			20	30						1,000			0	0
6	3,920	21	20			70		11,400			17	80						1,000			0	0
7	3,630	23	40			77		7,700			1							1,000			0	0
8	4,920	24	30			77		3,300			1	43						1,000			0	8
9	[1] 4,840	23	10			38		7,600			30	40						40			0	0
10	[1] 6,300		10			38		6,300			18							20			0	
11	[1] 6,100	21	60			56		35,000			40	60						1,000			0	0
12	4,960	21	40			60		16,500			7	20						1,000			0	0
13	5,040	21	50			60		9,000			4	28						1,000			0	0
14	4,560	21	50			61		3,000			6	60						703			8	0
15	5,090	21	75			60		2,500			16	28						397			4	2
16	5,240	21	30			63		2,300			19	36						1,000			0	0
17	5,050	22	20			68		1,800			7	10						397			0	2
18	5,320	21	20			70		3,200			4	17						1,000			0	0
19	5,280	20	20			73		4,000			7	20						1,000			0	0
20	5,150	25	20			73		(2)			(2)	(2)						1,000			0	0
21	4,120	25	15			73		(2)			(2)	(2)						1,000			0	0
22	5,530	25	15			74		(2)			(2)	(2)						100			0	0
23	5,420	26	75			73		(2)			(2)	(2)						1,000			2	2
24	5,820	26	20			73		1,800			4	20						377			0	0
25	6,250	24	15			79		1,500			1	15						703			0	0
26	6,300	24	15			79		2,300			5	30						1,000			0	0
27	6,200	22	15			80		1,400			1	4						683			0	0
28	4,060	22	15			80		1,600			2	8						1,000			0	0

[1] Impounded supply used, in whole or in part.

[2] Lost.

Summary of daily laboratory results reported from each individual plant, located elsewhere than on the Ohio River, included in the survey of 1923–24—Continued

ELMIRA (N. Y.) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
July, 1924	*1,000 gallons*	*° C.*																				
29	5,500	26	15	------	------	80	------	3,400	------	------	5	22	------	------	------	------	------	357	------	------	0	0
30	5,570	26	15	------	------	84	------	2,800	------	------	7	18	------	------	------	------	------	703	------	------	0	0
31	5,510	26	10	------	------	87	------	2,300	------	------	4	25	------	------	------	------	------	1,000	------	------	0	0
Mean	5,300	22	31	------	------	69	------	6,330	------	------	9	25	------	------	------	------	------	750	------	------	0.5	0.5
August, 1924																						
1	5,740	24	10	------	------	87	------	(2)	------	------	(2)	(2)	------	------	------	------	------	1,000	------	------	0	0
2	5,520	20	10	------	------	87	------	(2)	------	------	(2)	(2)	------	------	------	------	------	703	------	------	0	0
3	5,220	20	10	------	------	88	------	(2)	------	------	(2)	(2)	------	------	------	------	------	683	------	------	0	0
4	4,670	20	10	------	------	88	------	(2)	------	------	(2)	(2)	------	------	------	------	------	40	------	------	0	0
5	5,560	22	10	------	------	88	------	4,300	------	------	6	46	------	------	------	------	------	357	------	------	0	0
6	5,730	22	10	------	------	87	------	2,700	------	------	2	30	------	------	------	------	------	40	------	------	0	0
7	5,870	22	10	------	------	87	------	3,600	------	------	7	10	------	------	------	------	------	357	------	------	0	0
8	5,600	26	8	------	------	88	------	2,200	------	------	3	7	------	------	------	------	------	100	------	------	0	0
9	5,350	26	8	------	------	88	------	1,700	------	------	14	22	------	------	------	------	------	60	------	------	0	0
10	5,300	26	8	------	------	88	------	1,300	------	------	6	9	------	------	------	------	------	66	------	------	0	0
11	4,430	26	8	------	------	89	------	1,600	------	------	4	12	------	------	------	------	------	357	------	------	0	0
12	5,570	26	8	------	------	89	------	1,900	------	------	20	70	------	------	------	------	------	683	------	------	0	0
13	5,240	26	8	------	------	89	------	3,600	------	------	40	60	------	------	------	------	------	60	------	------	0	0
14	5,210	26	8	------	------	90	------	2,400	------	------	14	16	------	------	------	------	------	683	------	------	0	0
15	4,840	26	8	------	------	89	------	6,100	------	------	25	8	------	------	------	------	------	357	------	------	0	0
16	5,170	26	8	------	------	90	------	1,400	------	------	1	12	------	------	------	------	------	357	------	------	0	0
17	5,440	26	8	------	------	90	------	900	------	------	2	7	------	------	------	------	------	377	------	------	0	0
18	4,530	28	8	------	------	91	------	1,000	------	------	3	6	------	------	------	------	------	377	------	------	0	0
19	5,260	28	8	------	------	91	------	3,000	------	------	16	20	------	------	------	------	------	683	------	------	0	0
20	5,450	28	8	------	------	88	------	1,800	------	------	6	9	------	------	------	------	------	703	------	------	0	0
21	5,450	28	8	------	------	88	------	2,300	------	------	3	16	------	------	------	------	------	1,000	------	------	0	2
22	5,200	27	8	------	------	88	------	3,600	------	------	1	8	------	------	------	------	------	1,000	------	------	0	0
23	3,800	27	8	------	------	88	------	2,800	------	------	5	9	------	------	------	------	------	1,000	------	------	0	0
24	4,450	27	8	------	------	88	------	3,600	------	------	3	35	------	------	------	------	------	1,000	------	------	0	4

25	5,820	27	8	------	------	88	------	(2)	------	------	(2)	(2)						1,000	------	------	0	0
26	[1] 4,060	25	2,300	------	------	55	------	(2)	------	------	5	12	------	------	------	------	------	1,000	------	------	0	0
27	[1] 4,670	25	1,500	------	------	34	------	(2)	------	------	(2)	(2)	------	------	------	------	------	1,000	------	------	0	2
28	5,980	26	300	------	------	53	------	3,400	------	------	3	6	------	------	------	------	------	1,000	------	------	0	0
29	6,680	25	60	------	------	64	------	2,900	------	------	2	4	------	------	------	------	------	1,000	------	------	0	0
30	7,340	25	35	------	------	70	------	2,200	------	------	4	2	------	------	------	------	------	1,000	------	------	0	0
31	5,890	25	25	------	------	72	------	2,300	------	------	6	14	------	------	------	------	------	377	------	------	0	0
Mean	5,310	25	143	------	------	82	------	2,610	------	------	8	18	------	------	------	------	------	594	------	------	0	0.3
Sept., 1924																						
1	3,880	28	15	------	------	74	------	2,900	------	------	4	15	------	------	------	------	------	1,000	------	------	0	0
2	4,730	27	15	------	------	78	------	1,500	------	------	1	45	------	------	------	------	------	683	------	------	0	4
3	5,340	27	15	------	------	76	------	2,500	------	------	2	60	------	------	------	------	------	703	------	------	0	4
4	5,500	24	20	------	------	75	------	3,600	------	------	5	20	------	------	------	------	------	1,000	------	------	0	0
5	5,300	24	50	------	------	76	------	3,800	------	------	3	12	------	------	------	------	------	1,000	------	------	0	0
6	4,860	24	30	------	------	76	------	4,000	------	------	2	70	------	------	------	------	------	1,000	------	------	0	0
7	5,340	24	30	------	------	76	------	2,000	------	------	1	60	------	------	------	------	------	1,000	------	------	0	0
8	5,190	24	30	------	------	80	------	1,200	------	------	3	30	------	------	------	------	------	1,000	------	------	0	0
9	5,610	24	20	------	------	87	------	1,600	------	------	4	7	------	------	------	------	------	1,000	------	------	0	0
10	5,160	24	20	------	------	87	------	2,500	------	------	1	4	------	------	------	------	------	1,000	------	------	0	0
11	5,580	24	15	------	------	88	------	8,800	------	------	3	15	------	------	------	------	------	1,000	------	------	0	0
12	5,510	22	15	------	------	88	------	4,600	------	------	5	12	------	------	------	------	------	1,000	------	------	0	0
13	5,210	20	15	------	------	88	------	1,600	------	------	3	4	------	------	------	------	------	1,000	------	------	0	0
14	5,020	18	15	------	------	89	------	1,200	------	------	1	2	------	------	------	------	------	1,000	------	------	0	0
15	4,550	18	15	------	------	89	------	2,300	------	------	4	7	------	------	------	------	------	703	------	------	0	0
16	5,670	18	15	------	------	89	------	3,000	------	------	3	9	------	------	------	------	------	703	------	------	0	0
17	5,500	18	15	------	------	89	------	2,800	------	------	1	15	------	------	------	------	------	397	------	------	0	0
18	5,250	18	15	------	------	90	------	2,200	------	------	1	3	------	------	------	------	------	357	------	------	0	0
19	5,380	18	15	------	------	90	------	800	------	------	2	7	------	------	------	------	------	377	------	------	0	0
20	5,460	18	15	------	------	90	------	900	------	------	1	3	------	------	------	------	------	703	------	------	0	0
21	5,310	18	10	------	------	90	------	1,800	------	------	8	5	------	------	------	------	------	1,000	------	------	0	0
22	4,820	17	10	------	------	91	------	900	------	------	1	3	------	------	------	------	------	1,000	------	------	0	0
23	4,680	16	8	------	------	91	------	1,200	------	------	2	9	------	------	------	------	------	703	------	------	0	0
24	5,310	16	8	------	------	92	------	3,000	------	------	3	14	------	------	------	------	------	357	------	------	0	0
25	6,570	15	8	------	------	92	------	1,800	------	------	4	12	------	------	------	------	------	703	------	------	0	4
26	5,340	15	8	------	------	92	------	1,500	------	------	2	7	------	------	------	------	------	1,000	------	------	0	0
27	5,600	15	8	------	------	92	------	1,300	------	------	3	15	------	------	------	------	------	357	------	------	0	0
28	5,300	15	8	------	------	92	------	1,600	------	------	4	8	------	------	------	------	------	1,000	------	------	0	0
29	5,410	15	8	------	------	93	------	900	------	------	2	12	------	------	------	------	------	1,000	------	------	0	0
30	[1] 5,370	15	200	------	------	34	------	11,200	------	------	1	16	------	------	------	------	------					
Mean	5,260	19	22	------	------	84	------	2,630	------	------	3	17	------	------	------	------	------	824	------	------	0	0.4
Oct., 1924																						
1	[1] 5,300	15	100	------	------	35	------	15,300	------	------	2	4	------	------	------	------	------	1,000	------	------	0	0
2	[1] 5,450	15	50	------	------	35	------	8,800	------	------	1	6	------	------	------	------	------	1,000	------	------	0	0
3	[1] 5,350	15	50	------	------	35	------	16,000	------	------	2	9	------	------	------	------	------	1,000	------	------	0	0
4	[1] 5,160	15	40	------	------	35	------	12,000	------	------	4	5	------	------	------	------	------	1,000	------	------	0	0

[1] Impounded supply used, in whole or in part.

[2] Lost.

Summary of daily laboratory results reported from each individual plant, located elsewhere than on the Ohio River, included in the survey of 1923–24—Continued

ELMIRA (N. Y.) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Oct., 1924	*1,000 gallons*	° *C.*																				
5	[1] 5,650	15	40	------	------	35	------	10,500	------	------	42	7	------	------	------	------	------	1,000	------	------	0	0
6	[1] 6,620	17	20	------	------	56	------	8,400	------	------	7	5	------	------	------	------	------	1,000	------	------	0	0
7	5,260	17	8	------	------	61	------	2,300	------	------	6	9	------	------	------	------	------	1,000	------	------	0	0
8	5,320	15	8	------	------	61	------	1,800	------	------	2	12	------	------	------	------	------	1,000	------	------	0	0
9	5,300	15	8	------	------	65	------	5,000	------	------	3	6	------	------	------	------	------	1,000	------	------	0	0
10	5,350	15	8	------	------	66	------	2,000	------	------	4	19	------	------	------	------	------	1,000	------	------	0	0
11	6,000	15	8	------	------	70	------	5,800	------	------	3	7	------	------	------	------	------	1,000	------	------	0	0
12	4,570	14	8	------	------	70	------	1,300	------	------	1	5	------	------	------	------	------	377	------	------	0	0
13	5,390	12	8	------	------	70	------	1,500	------	------	1	4	------	------	------	------	------	357	------	------	0	0
14	5,650	12	8	------	------	76	------	1,800	------	------	4	7	------	------	------	------	------	1,000	------	------	0	0
15	5,630	12	8	------	------	76	------	2,600	------	------	3	3	------	------	------	------	------	100	------	------	0	0
16	5,200	12	8	------	------	76	------	2,100	------	------	1	5	------	------	------	------	------	357	------	------	0	0
17	6,130	12	8	------	------	77	------	1,600	------	------	4	4	------	------	------	------	------	80	------	------	0	0
18	7,500	12	8	------	------	78	------	1,900	------	------	2	6	------	------	------	------	------	1,000	------	------	0	0
19	5,030	12	8	------	------	78	------	3,200	------	------	3	8	------	------	------	------	------	357	------	------	0	0
20	4,980	12	8	------	------	78	------	2,600	------	------	7	6	------	------	------	------	------	377	------	------	0	0
21	5,380	10	6	------	------	77	------	11,700	------	------	4	34	------	------	------	------	------	80	------	------	0	0
22	5,360	10	6	------	------	77	------	9,300	------	------	2	16	------	------	------	------	------	60	------	------	0	0
23	5,380	10	6	------	------	80	------	5,100	------	------	3	20	------	------	------	------	------	80	------	------	0	0
24	5,250	10	6	------	------	80	------	3,300	------	------	4	12	------	------	------	------	------	377	------	------	0	0
25	5,220	10	10	------	------	80	------	4,800	------	------	7	9	------	------	------	------	------	60	------	------	0	0
26	5,360	10	8	------	------	80	------	5,600	------	------	5	28	------	------	------	------	------	40	------	------	0	0
27	3,310	10	8	------	------	80	------	6,000	------	------	20	36	------	------	------	------	------	40	------	------	0	0
28	5,400	10	8	------	------	81	------	3,100	------	------	6	17	------	------	------	------	------	40	------	------	0	0
29	5,610	10	8	------	------	85	------	2,300	------	------	2	4	------	------	------	------	------	100	------	------	0	0
30	5,660	10	8	------	------	86	------	1,700	------	------	1	9	------	------	------	------	------	703	------	------	0	0
31	5,200	10	8	------	------	86	------	1,900	------	------	2	7	------	------	------	------	------	1,000	------	------	0	0
Mean	5,420	13	16	------	------	68	------	5,200	------	------	5	10	------	------	------	------	------	570	------	------	0	0

NEW MILFORD (N. J.) WATER FILTRATION PLANT

Nov., 1923							(2)															
1	30,880	......	......	45	......	27	18	......	480	......	......	7	......	180	......	......	8	......	10	......	......	......
2	31,780	......	......	40	......	24	16	......	680	......	......	26	......	190	......	......	11	......	10	......	......	......
3	33,280	......	......	35	......	24	14	......	540	......	......	33	......	720	......	......	38	......	100	......	......	......
4	31,740	......	......	35	......	23	15	......	410	......	......	8	......	340	......	......	15	......	100	......	......	......
5	33,150	......	......	30	......	22	15	......	440	......	......	6	......	240	......	......	24	......	1,000	......	......	......
6	32,430	......	......	30	......	22	15	......	680	......	......	4	......	340	......	......	8	......	100	......	......	......
7	32,850	......	......	30	......	22	14	......	650	......	......	5	......	310	......	......	12	......	10	......	......	......
8	33,020	......	......	25	......	22	15	......	260	......	......	9	......	140	......	......	5	......	10	......	......	......
9	33,700	......	......	25	......	23	14	......	320	......	......	11	......	540	......	59	7	......	10	......	0	0
10	31,800	......	......	25	......	24	17	......	390	......	......	14	......	1,420	......	86	29	......	100	......	0	0
11	30,910	......	......	25	......	24	17	......	480	......	......	9	......	210	......	11	2	......	0	......	0	0
12	31,660	......	6	20	......	23	16	890	360	......	......	6	70	190	......	8	18	10	10	......	0	0
13	32,450	......	6	15	......	30	17	720	320	......	......	3	60	80	......	27	10	10	0	......	0	0
14	31,740	......	6	15	......	28	18	720	357	......	......	8	130	160	......	53	11	10	0	......	0	0
15	31,150	......	6	15	......	28	18	380	460	......	......	48	60	60	......	30	5	100	10	......	0	0
16	31,680	......	5	18	......	31	25	1,560	543	......	......	18	190	120	......	19	9	0	0	......	0	0
17	32,170	......	5	18	......	33	25	720	687	......	......	37	280	390	......	36	33	10	10	......	0	0
18	31,370	......	3	20	......	30	23	770	477	......	......	19	120	110	......	12	11	100	10	......	0	0
19	31,530	......	3	20	......	29	22	780	463	......	......	8	60	70	......	9	2	10	0	......	0	0
20	30,740	......	3	18	......	30	22	580	327	......	......	7	160	280	......	10	5	0	100	......	0	0
21	32,140	......	1	16	......	30	22	480	303	......	......	7	80	90	......	14	6	10	0	......	0	0
22	34,660	......	1	15	......	33	24	660	517	......	......	12	110	80	......	12	5	10	10	......	0	0
23	32,350	......	2	15	......	33	25	920	610	......	......	19	110	80	......	9	7	10	0	......	0	0
24	27,650	......	2	15	......	31	25	680	1,263	......	......	85	800	620	......	98	32	1,000	100	......	10	0
25	26,680	......	4	15	......	32	23	3,170	423	......	......	13	1,140	150	......	82	16	1,000	100	......	0	0
26	27,950	......	4	15	......	33	23	2,780	350	......	......	15	590	150	......	13	19	1,000	0	......	0	0
27	25,450	......	4	16	......	33	23	940	483	......	......	12	790	160	......	19	22	1,000	0	......	0	0
28	24,390	......	1	15	......	35	23	1,800	517	......	......	8	1,160	220	......	23	19	1,000	10	......	0	0
29	26,870	......	2	15	......	37	30	3,200	713	......	......	77	900	110	......	37	29	1,000	0	......	0	0
30	25,470	......	8	15	......	37	30	5,800	580	......	......	19	500	60	......	9	7	1,000	0	......	0	0
Mean	30,788	......	4	22	......	28	20	1,450	503	......	......	18	385	259	......	31	14	420	60	......	0.5	0
Dec., 1923							(2)															
1	22,480	......	16	15	......	34	29	7,200	837	......	......	45	3,800	420	......	68	39	1,000	100	......	0	0
2	22,100	......	8	15	......	35	29	8,500	703	......	......	14	1,900	160	......	42	23	100	0	......	0	0
3	25,460	......	1	15	......	36	29	6,600	427	......	......	30	1,600	120	......	39	27	100	0	......	0	0
4	29,770	......	2	15	......	36	29	6,600	473	......	......	21	1,200	140	......	24	19	100	0	......	0	0
5	29,980	......	2	15	......	39	34	4,600	553	......	......	35	400	120	......	19	16	1,000	10	......	0	0
6	27,510	......	6	15	......	35	28	2,800	477	......	......	37	800	290	......	28	31	10	100	......	0	0
7	26,420	......	4	15	......	31	25	5,800	657	......	......	52	1,100	110	......	45	39	1,000	100	......	0	0
8	25,990	......	10	15	......	31	24	5,400	507	......	......	33	2,600	530	......	59	32	1,000	100	......	0	0
9	25,660	......	3	16	......	30	24	4,200	657	......	......	74	500	160	......	85	19	100	0	......	10	0
10	26,890	......	2	16	......	30	22	3,800	467	......	......	35	600	160	......	74	55	10	100	......	10	0
11	26,860	......	4	16	......	27	21	900	530	......	......	32	300	150	......	40	31	10	0	......	10	0
12	26,680	......	5	16	......	25	18	1,400	647	......	......	27	400	110	......	59	31	10	100	......	0	0

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[1] Impounded supply used, in whole or in part.

[2] Filtered.

Summary of daily laboratory results reported from each individual plant, located elsewhere than on the Ohio River, included in the survey of 1923–24—Continued

NEW MILFORD (N. J.) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Dec., 1923	*1,000 gallons*	° *C.*																				
13	26,440	......	3	12	......	26	19	2,500	917	......	......	33	500	170	......	52	46	10	10	......	0	0
14	27,560	......	2	10	......	26	19	2,300	477	......	......	31	200	160	......	44	54	100	10	......	0	0
15	28,660	......	2	8	......	22	15	1,400	330	......	......	25	700	580	......	62	46	10	10	......	0	0
16	28,550	......	2	8	......	23	16	400	373	......	......	27	110	160	......	63	32	100	10	......	0	0
17	29,250	......	2	8	......	25	20	2,800	343	......	......	23	700	160	......	53	66	10	10	......	0	0
18	30,190	......	2	6	......	24	17	1,600	237	......	......	14	600	320	......	39	29	100	10	......	0	0
19	31,350	......	2	5	......	22	15	600	307	......	......	13	400	80	......	18	12	10	0	......	0	0
20	31,350	......	3	6	......	21	15	1,800	187	......	......	19	600	110	......	22	16	10	0	......	0	0
21	30,880	......	3	6	......	22	16	590	357	......	......	15	380	140	......	25	23	100	0	......	0	0
22	29,190	......	3	8	......	22	16	2,700	393	......	......	14	260	280	......	32	22	100	10	......	0	0
23	28,600	......	3	10	......	24	17	1,700	343	......	......	9	240	290	......	79	19	100	100	......	10	0
24	29,120	......	1	10	......	24	16	2,900	200	......	......	16	600	160	......	39	42	1,000	10	......	0	0
25	27,430	......	1	8	......	24	17	1,200	153	......	......	12	800	130	......	89	11	100	10	......	0	0
26	28,640	......	1	8	......	24	17	900	200	......	......	8	700	390	......	19	9	10	0	......	0	0
27	29,520	......	1	6	......	25	18	1,300	323	......	......	10	100	110	......	19	18	10	0	......	0	0
28	28,690	......	1	6	......	25	19	1,900	417	......	......	12	400	60	......	19	12	100	0	......	0	0
29	27,770	......	2	5	......	27	21	2,400	450	......	......	33	2,400	280	......	31	17	1,000	0	......	0	0
30	27,770	......	1	5	......	27	22	2,600	283	......	......	6	1,400	240	......	87	11	10	0	......	0	0
31	26,390	......	1	4	......	27	22	1,600	370	......	......	7	300	420	......	41	31	10	1,000	......	0	0
Mean	27,840	......	3	10	......	27	21	1,967	438	......	......	25	858	216	......	46	28	237	58	......	1.3	0
Jan., 1924							(1)															
1	25,120	......	0	4	......	28	23	2,900	233	......	......	8	500	190	......	38	17	10	0	......	0	0
2	27,900	......	0	4	......	30	25	1,800	367	......	......	8	300	120	......	27	2	100	10	......	0	0
3	28,940	......	0	4	......	28	23	900	533	......	......		700	140	......	19	8	100	10	......	0	0
4	29,230	......	4	18	......	27	22	3,500	290	......	......	18	1,300	110	......	34	9	100	10	......	0	0
5	28,040	......	2	18	......	28	24	3,100	383	......	......	9	2,200	190	......	51	39	100	1,000	......	10	2
6	28,390	......	2	14	......	28	24	1,140	277	......	......	8	190	60	......	18	8	100	0	......	0	0
7	31,180	......	2	10	......	29	25	590	350	......	......	10	170	60	......	29	9	0	0	......	0	0
8	31,020	......	2	4	......	28	21	1,600	437	......	......	8	300	110	......	34	22	100	0	......	0	0

-......	31,010	......	3	4	......	27	21	500	410	......	......	8	400	170	......	23	9	0	10	......	0	0
10......	31,000	......	3	4	......	27	21	500	400	......	......	10	700	90	......	31	12	10	0	......	0	0
11......	31,080	......	3	5	......	28	24	3,100	217	......	......	10	100	80	......	11	14	10	10	......	0	0
12......	30,520	......	3	5	......	26	20	3,100	497	......	......	21	2,500	260	......	72	6	10	10	......	0	0
13......	30,720	......	3	5	......	26	20	4,100	303	......	......	6	800	150	......	19	13	10	0	......	0	0
14......	31,390	......	3	5	......	24	20	400	407	......	......	6	200	100	......	19	11	10	10	......	0	0
15......	31,490	......	3	5	......	25	19	1,400	290	......	......	10	500	80	......	9	5	10	0	......	0	0
16......	31,740	......	1	5	......	27	21	1,300	550	......	......	9	200	90	......	13	12	10	0	......	0	0
17......	31,510	......	20	5	......	24	20	3,300	240	......	......	13	900	210	......	34	8	1,000	10	......	0	0
18......	31,450	......	5	6	......	24	20	2,800	563	......	......	27	1,400	140	......	31	19	100	10	......	0	0
19......	31,480	......	3	6	......	26	19	2,900	840	......	......	15	1,800	720	......	37	18	100	10	......	0	0
20......	30,530	......	3	6	......	26	19	3,200	943	......	......	19	200	380	......	56	25	100	10	......	0	0
21......	31,690	......	10	6	......	24	18	1,600	823	......	......	28	400	340	......	34	32	100	100	......	0	0
22......	31,550	......	1	5	......	24	17	900	930	......	......	34	200	280	......	97	42	10	100	......	10	0
23......	32,340	......	1	5	......	24	17	900	643	......	......	14	700	640	......	77	45	100	100	......	0	0
24......	31,670	......	2	5	......	24	19	600	807	......	......	30	300	320	......	42	58	0	0	......	0	0
25......	32,770	......	1	5	......	20	12	2,800	680	......	......	33	200	330	......	34	36	100	10	......	0	0
26......	33,610	......	16	5	......	20	14	2,700	613	......	......	29	1,200	980	......	142	51	100	10	......	10	0
27......	33,380	......	10	5	......	20	15	4,700	703	......	......	27	900	380	......	37	29	100	10	......	0	0
28......	34,180	......	1	5	......	22	16	1,300	460	......	......	22	500	250	......	43	34	0	10	......	0	0
29......	33,710	......	1	5	......	23	20	700	427	......	......	14	200	330	......	59	38	10	100	......	0	0
30......	34,950	......	1	5	......	25	18	500	517	......	......	14	900	120	......	83	57	100	10	......	0	0
31......	35,670	......	1	5	......	24	18	900	367	......	......	26	200	180	......	34	28	10	0	......	0	0
Mean	31,270	......	4	6	......	25	20	1,923	500	......	......	16	674	245	......	41	23	84	50	......	0.97	0.07
Feb., 1924																						
1......	35,500	......	2	5	......	24	(1) 18	3,200	647	......	......	17	500	110	......	34	22	10	10	......	0	0
2......	32,950	......	1	5	......	23	19	200	333	......	......	22	300	260	......	45	39	0	0	......	0	0
3......	30,860	......	2	4	......	25	20	800	263	......	......	18	200	110	......	29	21	0	0	......	0	0
4......	31,810	......	2	4	......	28	24	800	467	......	......	17	400	60	......	18	21	10	10	......	10	0
5......	31,470	......	12	4	......	27	23	800	493	......	......	13	200	110	......	55	13	10	10	......	0	0
6......	31,670	......	2	2	......	26	20	7,800	237	......	......	7	700	270	......	19	10	100	0	......	0	0
7......	33,030	......	4	2	......	25	20	3,800	200	......	......	13	900	110	......	27	13	10	10	......	0	0
8......	31,740	......	Tr.	2	......	28	23	3,900	627	......	......	14	300	180	......	13	4	100	0	......	0	0
9......	30,880	......	Tr.	2	......	29	24	1,200	613	......	......	5	400	440	......	24	11	10	0	......	0	0
10......	29,900	......	Tr.	3	......	28	23	1,100	543	......	......	8	400	550	......	169	15	10	1,000	......	10	2
11......	31,430	......	Tr.	3	......	28	23	1,400	747	......	......	18	3,800	760	......	39	26	100	100	......	10	0
12......	30,970	......	Tr.	5	......	28	22	1,900	930	......	......	22	400	350	......	46	22	0	100	......	0	0
13......	31,250	......	Tr.	5	......	26	20	600	417	......	......	22	400	190	......	62	37	10	0	......	0	0
14......	31,990	......	Tr.	5	......	28	21	300	590	......	......	20	600	220	......	115	14	10	100	......	0	0
15......	31,970	......	Tr.	5	......	28	21	1,700	443	......	......	15	200	140	......	45	36	10	100	......	0	0
16......	31,860	......	Tr.	6	......	25	21	600	653	......	......	18	900	520	......	83	51	10	100	......	0	0
17......	30,700	......	Tr.	6	......	26	21	290	430	......	......	18	80	120	......	24	13	0	0	......	0	0
18......	32,040	......	Tr.	5	......	28	22	260	367	......	......	17	70	120	......	21	13	0	0	......	0	0
19......	31,330	......	Tr.	5	......	29	20	440	497	......	......	14	90	160	......	27	14	0	0	......	0	0
20......	30,990	......	1	5	......	28	23	430	640	......	......	12	130	590	......	13	9	10	10	......	0	0
21......	30,520	......	1	5	......	29	25	560	337	......	......	17	240	510	......	84	17	100	10	......	0	0
22......	30,260	......	1	5	......	29	26	890	593	......	......	33	240	980	......	84	19	100	10	......	0	0

[1] Filtered

Tr=trace.

Summary of daily laboratory results reported from each individual plant, located elsewhere than on the Ohio River, included in the survey of 1923–24—Continued

NEW MILFORD (N. J.) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Feb., 1924	*1,000 gallons*	*° C.*																				
23	29, 590	......	1	5	......	30	27	660	470	......	......	31	580	290	......	28	18	100	0	......	0	0
24	28, 340	......	0	5	......	32	28	940	397	......	......	8	120	40	......	12	9	0	0	......	0	0
25	29, 680	......	0	5	......	35	31	670	210	......	......	10	90	60	......	14	4	10	0	......	0	0
26	30, 670	......	0	5	......	35	31	890	260	......	......	7	90	110	......	16	8	10	0	......	0	0
27	31, 240	......	1	4	......	36	30	550	213	......	......	11	90	180	......	26	13	10	0	......	0	0
28	31, 050	......	0	4	......	36	30	270	597	......	......	13	70	80	......	14	5	10	0	......	0	0
29	31, 370	......	0	4	......	36	32	540	327	......	......	13	80	40	......	12	15	10	0	......	0	0
Mean	31, 290	......	1	4	......	29	24	1, 293	467	......	......	16	434	264	......	41	18	26	23	......	1	0. 07
March, 1924																						
1	31, 620	......	0	4	......	35	(2) 30	520	470	......	......	21	380	280	......	38	12	10	10	......	0	0
2	31, 050	......	0	4	......	34	28	660	283	......	......	14	180	80	......	29	12	100	100	......	0	0
3	31, 960	......	1	4	......	33	27	320	330	......	......	7	220	180	......	15	8	10	0	......	0	0
4	31, 880	......	1	4	......	33	29	260	213	......	......	12	200	110	......	18	17	10	100	......	0	0
5	31, 530	......	4	4	......	33	28	620	420	......	......	8	40	380	......	22	12	1, 000	0	......	0	0
6	31, 610	......	6	4	......	34	28	850	213	......	......	18	360	260	......	27	46	100	0	......	0	0
7	31, 510	......	8	4	......	36	31	110	307	......	......	8	350	140	......	16	6	100	0	......	0	0
8	30, 700	......	1	5	......	33	29	690	573	......	......	22	550	590	......	32	19	1, 000	10	......	0	0
9	28, 580	......	1	6	......	30	27	480	830	......	......	22	260	150	......	24	14	10	100	......	0	0
10	29, 430	......	1	8	......	29	25	290	913	......	......	20	140	170	......	26	36	10	0	......	0	0
11	29, 160	......	3	8	......	29	25	860	1, 077	......	......	29	280	360	......	59	43	10	10	......	0	0
12	28, 960	......	3	8	......	26	23	2, 180	710	......	......	14	180	240	......	47	19	10	10	......	0	0
13	29, 160	......	5	8	......	26	23	360	457	......	......	16	250	490	......	32	35	100	10	......	0	0
14	29, 190	......	2	8	......	26	23	1, 350	560	......	......	25	80	230	......	33	26	0	10	......	0	0
15	28, 180	......	2	10	......	24	21	520	627	......	......	9	310	140	......	53	9	1, 000	10	......	10	0
16	27, 810	......	2	10	......	22	18	470	607	......	......	23	160	140	......	30	26	0	0	......	0	0
17	28, 800	......	1	8	......	21	19	180	460	......	......	26	90	110	......	80	23	0	0	......	0	0
18	28, 950	......	0	8	......	25	21	340	333	......	......	20	160	90	......	47	22	0	10	......	0	0
19	29, 070	......	0	8	......	22	19	280	293	......	......	22	160	140	......	42	18	0	10	......	0	0
20	29, 980	......	0	10	......	22	19	210	497	......	......	21	60	140	......	22	19	0	0	......	0	0

21	30,030	......	0	10	......	22	19	780	410	......	......	19	80	160	......	21	12	0	0	......	0	0
22	30,960	......	1	12	......	22	19	440	353	......	......	24	140	410	......	44	23	10	0	......	0	0
23	26,900	......	2	13	......	22	19	560	297	......	......	8	110	110	......	58	14	0	0	......	0	0
24	29,440	......	1	15	......	22	19	290	227	......	......	30	60	130	......	22	23	10	0	......	0	0
25	31,450	......	1	15	......	24	21	530	327	......	......	20	120	110	......	25	19	0	0	......	0	0
26	31,210	......	1	15	......	26	23	210	303	......	......	10	1,020	510	......	27	21	10	0	......	0	0
27	31,260	......	3	18	......	27	23	610	183	......	......	8	40	110	......	12	9	10	0	......	0	0
28	31,610	......	1	15	......	26	23	540	210	......	......	16	80	80	......	18	9	0	0	......	0	0
29	30,100	......	2	12	......	27	23	370	247	......	......	7	510	110	......	95	9	10	0	......	0	0
30	28,440	......	0	10	......	27	23	1,070	547	......	......	14	60	130	......	57	4	10	10	......	0	0
31	29,530	......	1	7	......	27	23	810	167	......	......	12	110	70	......	22	3	10	0	......	0	0
Mean	30,030	......	2	9	......	27	23	573	434	......	......	17	217	205	......	35	18	115	13	......	0.3	0
April, 1924							(1)															
1	28,980	......	0	5	......	30	27	680	230	......	......	10	180	80	......	24	7	10	0	......	0	0
2	29,300	......	1	5	......	32	28	560	257	......	......	6	250	110	......	17	11	100	0	......	0	0
3	29,200	......	2	4	......	32	28	380	417	......	......	5	110	40	......	8	5	10	0	......	0	0
4	29,320	......	3	4	......	33	28	140	377	......	......	12	90	80	......	15	5	10	0	......	0	0
5	29,750	......	3	3	......	31	27	960	230	......	......	19	480	280	......	38	16	1,000	0	......	10	0
6	28,820	......	6	2	......	30	26	720	293	......	......	10	430	40	......	34	6	0	0	......	0	0
7	29,860	......	22	12	......	28	23	620	603	......	......	12	650	180	......	55	34	100	1,000	......	10	6
8	29,240	......	15	12	......	26	23	740	910	......	......	10	390	260	......	14	6	1,000	100	......	0	0
9	29,370	......	12	10	......	20	16	1,780	957	......	......	28	310	390	......	34	32	100	100	......	0	0
10	29,850	......	15	10	......	20	16	520	763	......	......	25	230	320	......	24	13	100	100	......	0	0
11	29,360	......	5	10	......	16	12	440	553	......	......	25	60	390	......	48	35	10	10	......	0	0
12	29,140	......	10	10	......	15	9	520	470	......	......	33	460	420	......	36	66	10	10	......	0	2
13	28,210	......	3	12	......	15	8	680	363	......	......	19	110	270	......	49	25	10	10	......	0	0
14	29,580	......	4	15	......	15	8	530	350	......	......	20	190	190	......	49	29	10	0	......	0	0
15	29,270	......	4	15	......	16	12	890	377	......	......	22	450	320	......	36	34	10	10	......	0	0
16	29,070	......	10	18	......	16	11	650	553	......	......	16	180	150	......	12	8	0	10	......	0	0
17	29,050	......	8	20	......	15	10	480	330	......	......	18	380	380	......	31	28	0	10	......	0	0
18	27,280	......	6	20	......	16	11	920	443	......	......	17	870	160	......	42	12	1,000	10	......	0	0
19	27,810	......	12	22	......	17	13	680	1,423	......	......	32	480	490	......	38	25	100	10	......	0	0
20	25,860	......	6	22	......	17	13	1,040	877	......	......	11	340	70	......	22	8	100	0	......	0	0
21	28,120	......	4	22	......	18	15	890	810	......	......	12	270	120	......	18	9	100	100	......	0	0
22	28,790	......	4	25	......	16	13	780	843	......	......	30	220	210	......	33	19	100	100	......	0	0
23	29,430	......	6	26	......	14	11	850	670	......	......	27	260	210	......	39	23	10	1,000	......	0	0
24	29,460	......	10	25	......	14	11	790	780	......	......	24	420	290	......	66	36	10	100	......	10	0
25	29,250	......	4	25	......	16	11	460	450	......	......	13	180	110	......	18	9	10	0	......	0	0
26	29,320	......	6	25	......	16	10	180	687	......	......	30	290	980	......	20	15	10	10	......	0	0
27	27,050	......	7	20	......	15	11	480	427	......	......	20	60	120	......	9	9	0	0	......	0	0
28	29,890	......	7	18	......	15	11	220	373	......	......	6	50	130	......	3	9	10	0	......	0	0
29	29,240	......	7	18	......	17	13	820	413	......	......	7	150	80	......	7	4	10	10	......	0	0
30	28,850	......	5	15	......	17	13	380	353	......	......	6	120	350	......	12	13	10	10	......	0	0
Mean	28,920	......	7	15	......	20	15	659	553	......	......	17	287	241	......	28	18	132	90	......	1	0.3

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[1] Filtered.

Summary of daily laboratory results reported from each individual plant, located elsewhere than on the Ohio River, included in the survey of 1923–24—Continued

NEW MILFORD (N. J.) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
May, 1924	*1,000 gallons*	° *C.*					[3]															
1	28, 560	-------	5	15	------	16	13	820	313	--------	--------	9	160	60	-------	3	1	1, 000	10	--------	0	0
2	28, 170	-------	7	15	------	21	15	560	417	--------	--------	6	180	450	-------	15	3	10	0	--------	0	0
3	27, 500	-------	10	12	------	20	16	680	537	--------	--------	6	200	430	-------	24	8	10	0	--------	0	0
4	26, 240	-------	4	10	------	18	15	920	537	--------	--------	3	190	110	-------	12	4	0	0	--------	0	0
5	28, 760	-------	6	8	------	18	15	350	473	--------	--------	5	40	50	-------	11	5	10	0	--------	0	0
6	28, 750	-------	4	8	------	22	18	630	523	--------	--------	6	90	240	-------	11	4	0	0	--------	0	0
7	29, 140	-------	4	10	------	23	19	650	610	--------	--------	6	140	260	-------	18	11	100	0	--------	0	0
8	28, 750	-------	12	8	------	25	19	540	363	--------	--------	12	70	290	-------	19	9	10	10	--------	0	0
9	28, 500	-------	6	6	------	26	18	480	630	--------	--------	16	180	290	-------	22	5	100	10	--------	0	0
10	27, 530	-------	10	6	------	24	20	880	420	--------	--------	54	420	640	-------	52	74	1, 000	1, 000	--------	0	0
11	25, 560	-------	5	6	------	23	20	190	680	--------	--------	11	590	60	-------	32	6	10	0	--------	0	0
12	26, 030	-------	5	5	------	23	20	590	553	--------	--------	6	690	410	-------	18	1	1, 000	100	--------	0	0
13	26, 860	-------	10	5	------	24	20	870	537	--------	--------	9	250	60	-------	27	14	100	10	--------	10	0
14	26, 830	-------	8	4	------	24	19	1, 140	403	--------	--------	7	280	130	-------	14	7	100	100	--------	0	0
15	27, 110	-------	5	20	------	24	18	1, 050	490	--------	--------	15	380	110	-------	39	21	10	100	--------	10	0
16	26, 800	-------	8	14	------	22	17	480	377	--------	--------	15	80	80	-------	21	8	100	100	--------	0	0
17	27, 200	-------	4	8	------	19	14	970	285	--------	--------	9	380	360	-------	39	9	100	1, 000	--------	0	0
18	26, 360	-------	4	8	------	18	14	580	457	--------	--------	7	180	210	-------	22	15	10	0	--------	0	0
19	28, 070	-------	3	6	------	17	13	790	367	--------	--------	10	180	110	-------	23	9	100	0	--------	0	0
20	28, 140	-------	3	4	------	19	15	140	510	--------	--------	7	190	100	-------	8	2	10	10	--------	0	0
21	27, 940	-------	3	4	------	21	15	780	373	--------	--------	7	120	70	-------	20	4	10	10	--------	0	0
22	28, 220	-------	1	5	------	20	15	450	163	--------	--------	7	120	110	-------	18	8	10	0	--------	0	0
23	28, 120	-------	3	6	------	23	16	530	367	--------	--------	8	240	40	-------	17	11	100	0	--------	0	0
24	28, 100	-------	5	12	------	24	17	630	787	--------	--------	43	140	30	-------	42	13	100	10	--------	0	0
25	27, 410	-------	1	12	------	22	18	740	587	--------	--------	14	290	140	-------	39	5	100	10	--------	0	0
26	28, 780	-------	2	10	------	21	17	790	400	--------	--------	10	250	80	-------	14	5	1, 000	10	--------	0	0
27	28, 100	-------	6	10	------	23	18	1, 120	343	--------	--------	7	90	60	-------	16	8	1, 000	0	--------	0	0
28	28, 210	-------	8	10	------	25	21	320	383	--------	--------	15	80	110	-------	18	14	10	10	--------	0	0
29	27, 790	-------	1	10	------	28	23	240	447	--------	--------	14	180	90	-------	19	17	100	10	--------	0	0
30	28, 040	-------	1	10	------	26	23	650	453	--------	--------	11	360	610	-------	42	21	100	10	--------	0	0
31	27, 210	-------	2	10	------	26	23	380	377	--------	--------	21	340	580	-------	28	19	100	10	--------	0	0
Mean	27, 700	-------	5	9	------	22	18	643	457	--------	--------	12	228	206	-------	23	11	207	82	--------	0. 6	0

June, 1924							(3)														
1	25,340	------	4	10	------	27	24	1,280	427	------	------	9	40	180	------	24	11	100	10	------	0	0
2	26,660	------	3	12	------	27	24	420	290	------	------	8	40	80	------	28	9	10	10	------	0	0
3	27,530	------	5	15	------	32	26	780	457	------	------	6	90	60	------	48	5	10	10	------	0	0
4	28,330	------	3	16	------	32	26	140	267	------	------	9	70	740	------	29	12	10	10	------	0	0
5	28,580	------	3	18	------	33	26	440	550	------	------	57	110	180	------	52	6	10	10	------	0	0
6	28,370	------	2	18	------	34	26	820	320	------	------	48	190	110	------	38	7	1,000	10	------	0	0
7	29,110	------	2	25	------	27	24	790	890	------	------	49	290	390	------	44	12	1,000	10	------	0	0
8	27,630	------	4	18	------	35	27	480	420	------	------	13	430	180	------	66	9	100	0	------	0	0
9	28,880	------	4	14	------	35	27	560	390	------	------	17	190	40	------	29	3	10	10	------	10	0
10	28,990	------	3	12	------	32	24	490	340	------	------	7	390	140	------	39	12	1,000	10	------	0	0
11	28,990	------	2	12	------	35	28	460	377	------	------	5	620	390	------	59	14	10	0	------	0	0
12	28,740	------	2	10	------	35	27	880	280	------	------	7	90	60	------	8	4	0	10	------	0	0
13	28,610	------	3	10	------	33	28	300	283	------	------	13	80	140	------	15	4	0	0	------	0	0
14	28,270	------	3	10	------	35	28	550	487	------	------	15	300	540	------	52	9	0	0	------	0	0
15	28,400	------	1	10	------	35	29	480	693	------	------	4	80	650	------	35	22	10	0	------	0	0
16	28,400	------	3	10	------	35	29	390	610	------	------	9	260	200	------	18	5	100	0	------	0	0
17	29,070	------	2	10	------	38	30	280	327	------	------	3	40	80	------	19	5	0	0	------	0	0
18	29,040	------	1	10	------	39	31	420	310	------	------	5	730	180	------	14	4	0	10	------	0	0
19	30,360	------	2	8	------	39	31	920	280	------	------	6	820	120	------	14	8	10	0	------	0	0
20	30,930	------	1	8	------	39	30	1,020	373	------	------	6	130	110	------	9	8	0	10	------	0	0
21	31,200	------	2	12	------	39	30	380	907	------	------	11	320	180	------	39	5	100	0	------	0	0
22	30,280	------	2	8	------	38	32	760	310	------	------	15	550	280	------	19	25	10	1,000	------	10	0
23	31,990	------	------	8	------	38	30	------	357	------	------	29	------	420	------	------	19	------	10	------	------	0
24	32,820	------	4	8	------	38	34	820	360	------	------	6	370	320	------	69	4	0	100	------	0	0
25	33,000	------	6	8	------	39	32	580	400	------	------	9	220	450	------	42	35	10	1,000	------	10	0
26	34,670	------	8	8	------	41	32	310	513	------	------	9	380	280	------	51	13	10	10	------	0	0
27	34,050	------	4	6	------	39	33	1,360	513	------	------	12	240	240	------	67	7	0	100	------	0	0
28	32,210	------	2	8	------	42	33	890	710	------	------	43	1,930	1,870	------	161	34	100	1,000	------	0	0
29	31,670	------	4	8	------	42	35	120	637	------	------	22	180	430	------	62	6	0	10	------	0	0
30	33,120	------	2	6	------	41	35	400	603	------	------	3	190	90	------	51	14	100	0	------	0	0
Mean	28,090	------	3	11	------	36	29	604	456	------	------	15	339	304	------	42	11	128	45	------	1	0
July, 1924							(3)														
1	32,160	------	1	5	------	42	35	460	283	------	------	6	590	350	------	98	13	10	1,000	------	0	0
2	32,060	------	1	5	------	42	34	120	353	------	------	4	320	240	------	62	59	0	10	------	0	0
3	30,660	------	1	5	------	41	32	80	453	------	------	13	220	490	------	91	4	0	1,000	------	0	0
4	27,510	------	1	[illegible]	------	41	33	110	433	------	------	16	240	490	------	87	45	100	100	------	10	0
5	28,000	------	1	[illegible]	------	40	35	210	470	------	------	43	360	390	------	77	29	1,000	1,000	------	10	0
6	28,750	------	3	[illegible]	------	40	23	170	323	------	------	23	70	60	------	84	48	0	10	------	0	0
7	33,110	------	4	6	------	42	37	90	330	------	------	5	100	90	------	27	3	0	0	------	0	0
8	32,100	------	4	6	------	40	36	110	500	------	------	3	80	260	------	49	24	10	10	------	0	0
9	32,800	------	1	10	------	42	34	1,650	420	------	------	24	1,040	240	------	98	29	1,000	10	------	10	0
10	32,930	------	2	10	------	41	34	1,110	430	------	------	6	740	170	------	92	76	1,000	100	------	0	0
11	33,090	------	2	10	------	41	35	1,520	597	------	------	44	670	90	------	78	31	1,000	0	------	10	0
12	33,320	------	1	8	------	43	35	290	480	------	------	29	380	240	------	98	37	1,000	1,000	------	10	0
13	31,600	------	1	8	------	43	37	400	1,760	------	------	15	390	770	------	158	79	100	10	------	0	0
14	33,320	------	3	6	------	43	38	70	437	------	------	4	140	90	------	63	8	0	10	------	0	0

[3] Filtered.

Summary of daily laboratory results reported from each individual plant, located elsewhere than on the Ohio River, included in the survey of 1923–24—Continued

NEW MILFORD (N. J.) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
July, 1924	*1,000 gallons*	° *C.*																				
15	32, 880	------	1	6	------	47	38	180	473	------	------	16	60	170	------	10	2	10	0	------	0	0
16	33, 190	------	1	4	------	45	38	160	1, 230	------	------	14	140	160	------	83	4	0	10	------	0	0
17	33, 040	------	1	4	------	50	42	240	720	------	------	19	220	830	------	62	26	0	1, 000	------	10	0
18	32, 710	------	1	4	------	50	42	680	467	------	------	14	360	300	------	154	21	0	100	------	0	0
19	31, 990	------	3	4	------	46	37	290	450	------	------	17	280	230	------	------	9	100	1, 000	------	10	0
20	30, 370	------	10	5	------	47	37	120	170	------	------	16	20	80	------	33	14	0	0	------	0	0
21	31, 830	------	4	5	------	43	37	110	597	------	------	22	20	50	------	91	24	0	0	------	0	0
22	30, 850	------	4	5	------	46	37	50	537	------	------	5	60	370	------	111	26	100	10	------	10	0
23	31, 950	------	4	5	------	47	35	60	130	------	------	3	90	50	------	8	1	100	10	------	10	0
24	32, 310	------	5	5	------	46	37	80	337	------	------	14	10	20	------	34	41	0	0	------	0	0
25	33, 320	------	6	6	------	46	35	180	317	------	------	6	70	40	------	47	4	0	0	------	0	0
26	35, 780	------	6	6	------	51	35	50	197	------	------	12	250	260	------	------	7	1, 000	100	------	0	0
27	34, 520	------	4	6	------	50	35	80	237	------	------	17	40	370	------	21	8	0	10	------	0	0
28	35, 550	------	2	6	------	50	35	160	430	------	------	5	90	30	------	26	2	0	0	------	0	0
29	35, 640	------	6	5	------	46	35	110	993	------	------	8	60	30	------	75	10	10	0	------	10	0
30	36, 690	------	6	8	------	45	35	90	337	------	------	5	90	270	------	12	3	0	0	------	0	0
31	35, 780	------	2	8	------	47	38	150	313	------	------	7	60	70	------	10	1	0	0	------	0	0
Mean	32, 610	------	3	6	------	45	36	296	499	------	------	14	234	236	------	67	22	211	210	------	3. 2	0
August, 1924																						
1	34, 620	------	3	8	------	47	(3) 34	190	200	------	------	9	220	330	------	33	13	100	1, 000	------	10	2
2	30, 550	------	3	8	------	48	38	460	347	------	------	12	340	310	------	39	7	10	1, 000	------	10	0
3	26, 310	------	3	8	------	45	35	130	180	------	------	10	50	160	------	21	8	1, 000	10	------	10	0
4	28, 260	------	3	8	------	46	36	80	193	------	------	8	30	20	------	9	5	10	10	------	0	0
5	28, 780	------	6	5	------	42	36	40	110	------	------	3	70	80	------	19	2	10	100	------	10	0
6	29, 790	------	3	5	------	46	39	300	83	------	------	5	30	120	------	34	27	10	0	------	10	0
7	31, 090	------	4	3	------	45	36	110	420	------	------	32	30	60	------	36	1	0	10	------	0	0
8	32, 160	------	4	3	------	42	38	840	433	------	------	8	350	40	------	22	9	100	0	------	0	0
9	32, 420	------	4	3	------	51	41	340	277	------	------	33	80	60	------	18	1	10	1, 000	------	0	0
10	31, 710	------	5	3	------	47	40	60	437	------	------	16	40	60	------	29	7	100	1, 000	------	10	0

11	33,510	------	5	3	------	51	43	40	230	------	------	8	90	40	------	105	3	100	100	------	10	2
12	32,270	------	3	3	------	54	43	270	507	------	------	10	1,470	260	------	44	5	100	1,000	------	0	0
13	32,370	------	1	3	------	49	40	450	483	------	------	8	190	190	------	24	6	1,000	100	------	10	2
14	31,660	------	1	3	------	51	40	350	657	------	------	4	180	260	------	24	4	0	10	------	0	0
15	31,510	------	3	3	------	51	42	480	547	------	------	14	120	110	------	160	11	0	0	------	10	0
16	31,150	------	1	3	------	51	42	680	420	------	------	12	390	1,490	------	180	112	100	10	------	10	0
17	28,850	------	1	3	------	52	41	570	230	------	------	30	140	130	------	31	19	0	100	------	0	0
18	31,310	------	1	3	------	54	47	650	437	------	------	18	250	210	------	29	7	10	0	------	0	0
19	32,460	------	0	3	------	51	42	610	377	------	------	32	370	60	------	6	2	100	0	------	0	0
20	32,300	------	0	3	------	54	46	520	360	------	------	8	180	50	------	42	27	100	0	------	0	0
21	32,290	------	0	3	------	54	44	490	283	------	------	6	470	980	------	98	14	10	100	------	0	0
22	30,940	------	0	3	------	51	42	290	260	------	------	8	240	440	------	39	4	0	10	------	0	0
23	30,080	------	1	3	------	53	42	240	313	------	------	38	50	120	------	29	4	10	100	------	0	0
24	29,510	------	1	3	------	54	44	350	350	------	------	31	80	110	------	19	6	0	0	------	0	0
25	30,530	------	1	3	------	55	45	190	690	------	------	37	70	120	------	33	2	0	10	------	0	0
26	30,140	------	2	3	------	54	43	850	953	------	------	20	690	180	------	68	32	1,000	1,000	------	0	0
27	30,390	------	5	3	------	54	43	640	477	------	------	28	1,150	820	------	121	74	1,000	10	------	10	0
28	30,700	------	4	3	------	50	41	790	240	------	------	12	120	420	------	7	3	100	100	------	0	0
29	30,980	------	3	4	------	50	45	280	650	------	------	12	120	190	------	92	8	10	0	------	0	0
30	31,240	------	3	5	------	50	43	210	330	------	------	7	1,160	1,370	------	108	49	10	100	------	10	0
31	29,970	------	2	5	------	54	44	70	320	------	------	53	40	240	------	51	34	10	0	------	0	0
Mean	31,000	------	2	4	------	53	41	371	381	------	------	17	284	291	------	51	16	162	222	------	3.9	0.2
Sept., 1924							(1)															
1	30,980	------	3	5	------	55	44	160	253	------	------	19	230	80	------	89	17	10	0	------	0	0
2	31,380	------	3	5	------	55	44	180	533	------	------	11	440	210	------	104	11	100	0	------	0	0
3	30,460	------	5	5	------	55	47	890	580	------	------	63	670	280	------	124	87	1,000	1,000	------	10	0
4	30,540	------	4	5	------	55	47	150	597	------	------	39	140	740	------	47	26	10	10	------	0	0
5	30,280	------	4	5	------	52	47	420	497	------	------	10	70	580	------	52	11	0	0	------	0	0
6	30,320	------	6	5	------	52	41	760	477	------	------	17	540	1,350	------	49	5	10	100	------	10	0
7	29,270	------	8	8	------	50	41	1,420	700	------	------	39	830	480	------	87	58	0	10	------	0	0
8	30,960	------	8	6	------	50	42	460	483	------	------	27	570	220	------	54	9	0	10	------	0	0
9	30,430	------	8	6	------	54	47	510	533	------	------	39	1,290	890	------	48	7	10	10	------	0	0
10	30,610	------	9	5	------	50	44	690	497	------	------	64	220	290	------	142	52	100	10	------	10	0
11	30,900	------	9	3	------	52	46	690	233	------	------	25	110	180	------	111	33	1,000	100	------	0	0
12	30,040	------	10	3	------	54	48	170	267	------	------	52	340	220	------	78	44	100	10	------	0	0
13	30,280	------	10	5	------	53	47	420	423	------	------	66	220	310	------	62	15	10	100	------	0	0
14	29,520	------	16	5	------	54	47	220	403	------	------	51	260	940	------	75	62	0	0	------	0	0
15	31,140	------	12	3	------	55	47	190	253	------	------	15	90	180	------	64	6	0	0	------	0	0
16	31,780	------	10	3	------	51	44	280	350	------	------	44	180	410	------	116	93	0	10	------	0	0
17	31,710	------	3	6	------	52	45	540	1,370	------	------	40	510	310	------	49	24	0	0	------	0	0
18	32,430	------	2	10	------	54	48	340	2,570	------	------	48	380	580	------	81	44	0	0	------	0	0
19	32,170	------	5	10	------	51	45	540	4,500	------	------	19	330	580	------	43	35	0	0	------	0	0
20	32,200	------	5	10	------	54	47	910	8,330	------	------	106	420	2,500	------	129	97	10	10	------	10	0
21	31,020	------	5	10	------	54	47	2,700	5,670	------	------	118	1,000	9,300	------	90	51	10	0	------	0	0
22	29,660	------	3	10	------	57	48	1,500	5,750	------	------	53	800	4,200	------	170	145	10	10	------	0	0
23	32,590	------	3	10	------	55	47	3,200	2,853	------	------	43	2,900	4,500	------	276	238	100	10	------	10	0
24	31,020	------	1	10	------	53	47	1,140	1,383	------	------	25	1,800	1,690	------	65	47	10	100	------	0	0
25	28,170	------	2	8	------	55	47	2,900	750	------	------	26	2,850	310	------	42	36	0	10	------	0	0

[1] Filtered.

Summary of daily laboratory results reported from each individual plant, located elsewhere than on the Ohio River, included in the survey of 1923–24—Continued

NEW MILFORD (N. J.) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Sept., 1924	*1,000 gallons*	*° C.*																				
26	28,590	......	3	8	......	55	47	2,900	980	......	......	39	2,700	490	......	71	22	10	10	......	0	0
27	28,410	......	4	8	......	53	47	6,800	713	......	......	20	4,600	1,600	......	42	9	10	10	......	0	0
28	28,140	......	7	8	......	54	47	380	540	......	......	33	390	760	......	84	52	10	0	......	0	0
29	28,590	......	5	10	......	55	47	1,210	337	......	......	24	1,160	410	......	52	11	0	10	......	0	0
30	28,350	......	8	12	......	57	46	540	1,210	......	......	40	410	220	......	92	34	1,000	1,000	......	10	0
Mean	30,400	......	6	7	......	54	46	1,110	1,470	......	......	40	880	1,160	......	85	46	117	85	......	2	0
Oct., 1924																						
1	28,800	......	25	8	......	53	(3) 47	8,400	947	......	......	8	5,700	3,600	......	152	127	1,000	1,000	......	10	0
2	27,840	......	20	9	......	53	46	3,100	1,500	......	......	22	3,800	2,200	......	57	3	1,000	10	......	0	0
3	27,900	......	4	9	......	55	49	4,200	667	......	......	30	1,800	280	......	52	18	1,000	10	......	10	0
4	28,040	......	4	8	......	51	45	11,500	530	......	......	49	8,700	320	......	140	65	1,000	100	......	10	0
5	26,730	......	3	8	......	48	42	1,200	1,020	......	......	12	800	490	......	122	12	10	10	......	0	0
6	29,040	......	3	8	......	48	42	700	393	......	......	14	400	380	......	77	24	10	100	......	0	0
7	29,780	......	3	8	......	41	35	1,000	353	......	......	23	800	780	......	52	16	1,000	100	......	0	0
8	27,810	......	4	7	......	41	36	550	547	......	......	27	690	290	......	38	9	1,000	100	......	10	0
9	30,050	......	2	6	......	41	35	630	327	......	......	14	330	210	......	32	13	100	10	......	10	0
10	29,620	......	2	6	......	42	35	690	477	......	......	25	160	380	......	19	14	100	10	......	0	0
11	27,970	......	3	8	......	39	34	550	813	......	......	47	380	790	......	85	57	1,000	1,000	......	10	0
12	26,930	......	1	8	......	40	34	870	570	......	......	22	390	270	......	65	29	100	10	......	0	0
13	29,660	......	1	6	......	42	36	720	323	......	......	56	320	190	......	53	9	10	10	......	0	0
14	32,270	......	1	5	......	42	36	1,250	410	......	......	30	510	1,080	......	66	47	100	100	......	0	0
15	32,570	......	1	4	......	42	36	840	480	......	......	29	370	620	......	61	31	100	10	......	0	0
16	31,980	......	3	10	......	42	36	160	560	......	......	11	420	460	......	57	3	100	100	......	0	0
17	30,400	......	2	12	......	42	36	870	573	......	......	15	240	120	......	25	15	100	10	......	0	0
18	28,880	......	2	12	......	39	33	720	910	......	......	42	240	1,250	......	70	11	100	10	......	0	0
19	27,370	......	4	15	......	38	34	590	463	......	......	39	1,080	130	......	60	19	1,000	10	......	0	0
20	30,340	......	3	15	......	38	34	740	420	......	......	16	430	390	......	70	9	10	100	......	0	0
21	30,550	......	3	15	......	39	34	260	420	......	......	14	110	160	......	90	8	10	0	......	0	0

22	30,860	------	1	20	------	41	36	1,800	373	------	------	20	500	750	------	67	42	10	0	------	0	0
23	30,890	------	2	18	------	38	33	340	630	------	------	20	310	710	------	140	74	10	0	------	0	0
24	29,310	------	2	18	------	38	33	650	690	------	------	14	250	230	------	50	21	0	0	------	0	0
25	28,740	------	2	15	------	41	35	560	1,740	------	------	55	440	770	------	80	5	100	0	------	0	0
26	25,960	------	3	15	------	40	35	480	1,433	------	------	58	210	370	------	85	27	0	0	------	0	0
27	28,960	------	3	15	------	38	33	2,190	1,620	------	------	17	240	120	------	109	74	10	0	------	0	0
28	28,690	------	6	12	------	42	35	840	1,820	------	------	8	580	960	------	122	79	10	0	------	0	0
29	28,950	------	10	8	------	40	35	420	3,300	------	------	23	280	1,200	------	165	42	10	0	------	0	0
30	28,810	------	4	8	------	40	35	5,200	7,370	------	------	22	300	10,700	------	50	14	100	10	------	0	0
31	28,690	------	3	8	------	41	36	2,100	8,433	------	------	39	200	7,100	------	80	9	10	10	------	0	0
Mean	29,140	------	4	10	------	42	37	1,750	1,290	------	------	26	996	1,200	------	77	30	294	91	------	1.9	0

NIAGARA FALLS (N. Y.) WATER FILTRATION PLANT

Oct., 1923																					
1	13,469	18	10	------	------	96	------	5,900	------	2,900	800	5	------	------	------	------	------	1,000	------	1,000	20	0
2	13,108	18	10	------	------	94	------	8,000	------	2,900	900	3	------	------	------	------	------	1,000	------	1,000	20	0
3	12,336	18	10	------	------	92	------	6,000	------	2,100	600	3	------	------	------	------	------	1,000	------	1,000	20	0
4	11,949	18	10	------	------	95	------	5,400	------	1,800	550	4	------	------	------	------	------	670	------	1,000	13	0
5	11,391	18	10	------	------	96	------	6,800	------	2,100	750	6	------	------	------	------	------	1,000	------	1,000	7	0
6	11,317	18	10	------	------	90	------	7,400	------	2,700	1,000	9	------	------	------	------	------	1,000	------	1,000	20	1
7	10,679	17	10	------	------	92	------	7,000	------	2,600	850	6	------	------	------	------	------	------	------	------	------	------
8	11,649	17	10	------	------	93	------	6,700	------	1,900	650	5	------	------	------	------	------	670	------	1,000	7	1
9	11,298	18	15	------	------	94	------	6,400	------	2,100	900	5	------	------	------	------	------	670	------	1,000	13	0
10	11,117	18	10	------	------	96	------	6,800	------	2,000	750	9	------	------	------	------	------	1,000	------	1,000	13	0
11	11,026	18	10	------	------	92	------	6,000	------	1,800	450	5	------	------	------	------	------	670	------	1,000	7	0
12	10,626	18	10	------	------	91	------	7,200	------	2,300	800	6	------	------	------	------	------	1,000	------	1,000	7	0
13	10,832	17	10	------	------	95	------	7,800	------	3,100	1,100	8	------	------	------	------	------	1,000	------	1,000	13	0
14	9,761	18	10	------	------	93	------	Not plated					------	------	------	------	------	Not plated				
15	11,821	18	10	------	10	92	90	7,200	------	2,000	900	5	------	------	------	------	------	3,970	------	1,000	20	0
16	11,874	17	10	------	10	91	89	8,100	------	2,800	850	8	------	------	------	------	------	3,970	------	1,000	7	0
17	11,507	16	10	------	10	94	91	7,500	------	2,200	550	5	------	------	------	------	------	1,000	------	1,000	7	0
18	10,882	15	10	------	10	95	91	8,200	------	3,000	1,200	21	------	------	------	------	------	670	------	1,000	7	2
19	11,379	15	10	------	10	97	98	10,000	------	5,400	2,500	16	------	------	------	------	------	7,030	------	1,000	7	2
20	11,219	15	28	------	14	98	94	11,000	------	6,000	2,200	12	------	------	------	------	------	7,030	------	1,000	13	0
21	11,411	15	19	------	12	98	96	12,000	------	5,200	1,600	21	------	------	------	------	------	10,000	------	1,000	20	2
22	13,350	15	15	------	12	99	96	8,000	------	3,000	1,200	5	------	------	------	------	------	7,030	------	1,000	13	0
23	11,969	15	15	------	10	97	95	7,400	------	2,900	900	7	------	------	------	------	------	3,970	------	1,000	20	1
24	11,037	15	15	------	11	94	91	8,000	------	3,400	1,000	7	------	------	------	------	------	670	------	1,000	13	0
25	10,501	14	14	------	11	96	93	13,000	------	6,000	1,600	8	------	------	------	------	------	3,970	------	1,000	7	0
26	10,719	13	13	------	10	98	96	7,600	------	3,200	1,700	7	------	------	------	------	------	1,000	------	1,000	13	0
27	10,739	13	13	------	10	93	90	11,000	------	6,000	1,900	7	------	------	------	------	------	10,000	------	1,000	20	0
28	9,771	12	12	------	5	95	90	10,000	------	4,600	1,100	9	------	------	------	------	------	10,000	------	1,000	20	0

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[3] Filtered.

Summary of daily laboratory results reported from each individual plant, located elsewhere than on the Ohio River, included in the survey of 1923–24—Continued

NIAGARA FALLS (N. Y.) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Oct., 1923	*1,000 gallons*	*° C.*																				
29	11,381	12	12	------	10	97	91	8,000	------	2,600	800	6	------	------	------	------	------	3,970	------	1,000	7	0
30	10,808	12	12	------	5	98	91	7,200	------	2,100	800	5	------	------	------	------	------	1,000	------	1,000	13	0
31	10,69[illegible]	12	12	------	5	99	94	5,500	------	2,000	800	4	------	------	------	------	------	7,030	------	1,000	20	0
Mean	11,342	16	12	------	10	95	93	7,900	------	3,090	1,060	8	------	------	------	------	------	4,810	------	1,000	13	0.3
Nov., 1923																						
1	10,788	12	20	------	13	97	95	9,700	------	4,500	700	9	------	------	------	------	------	670	------	670	13	0
2	10,899	12	15	------	11	95	90	9,200	------	5,100	2,400	5	------	------	------	------	------	670	------	670	7	0
3	10,802	11	10	------	10	92	89	12,000	------	6,200	2,500	3	------	------	------	------	------	3,970	------	3,970	13	0
4	9,914	11	10	------	10	92	89	8,800	------	2,100	800	5	------	------	------	------	------	7,030	------	330	7	0
5	11,455	11	10	------	10	95	89	7,500	------	2,400	900	6	------	------	------	------	------	670	------	670	7	2
6	10,627	11	10	------	10	100	90	5,200	------	2,900	900	4	------	------	------	------	------	670	------	330	13	1
7	10,581	10	10	------	5	98	96	9,900	------	4,800	400	8	------	------	------	------	------	3,630	------	670	7	0
8	10,519	10	10	------	5	100	90	6,000	------	3,100	1,000	5	------	------	------	------	------	3,970	------	670	13	0
9	10,588	10	10	------	5	98	98	10,000	------	5,500	2,200	19	------	------	------	------	------	1,000	------	3,970	13	2
10	10,456	10	12	------	5	101	98	5,200	------	2,100	900	7	------	------	------	------	------	1,000	------	670	7	0
11	9,912	9	12	------	11	102	98	6,600	------	2,000	700	5	------	------	------	------	------	1,000	------	670	7	0
12	11,831	9	15	------	12	103	96	7,800	------	2,200	800	10	------	------	------	------	------	1,000	------	670	20	1
13	10,957	9	12	------	10	101	97	7,600	------	3,000	1,000	7	------	------	------	------	------	3,970	------	3,630	13	5
14	10,959	9	12	------	10	104	102	7,400	------	2,300	900	7	------	------	------	------	------	1,000	------	330	13	0
15	10,785	9	12	------	10	100	99	6,600	------	1,900	800	17	------	------	------	------	------	670	------	0	7	0
16	10,635	9	12	------	10	98	97	6,000	------	2,600	600	7	------	------	------	------	------	1,000	------	670	7	1
17	11,674	9	12	------	10	103	101	5,500	------	1,900	400	11	------	------	------	------	------	3,630	------	330	7	0
18	9,479	9	12	------	10	101	99	7,100	------	2,900	600	9	------	------	------	------	------	3,970	------	670	7	0
19	11,356	9	41	------	17	101	99	8,800	------	4,600	500	5	------	------	------	------	------	3,970	------	1,000	13	0
20	10,955	8	17	------	10	99	97	9,400	------	4,400	600	10	------	------	------	------	------	670	------	670	7	1
21	10,774	8	15	------	10	100	97	7,600	------	4,800	650	12	------	------	------	------	------	1,000	------	1,000	20	3
22	10,534	8	15	------	10	103	98	6,700	------	3,700	600	8	------	------	------	------	------	1,000	------	670	7	1
23	10,644	8	15	------	10	100	98	8,100	------	3,800	1,000	11	------	------	------	------	------	670	------	330	13	3
24	10,484	8	15	------	10	96	94	9,000	------	3,500	1,000	12	------	------	------	------	------	3,630	------	330	7	0

25	9,384	8	16		10	100	98	8,000		2,400	900	7						3,630		330	7	0
26	11,454	8	17		11	101	98	5,500		2,600	800	5						670		3,630	7	0
27	10,894	8	20		12	97	95	6,300		2,000	650	5						3,630		670	0	0
28	10,668	7	20		12	100	97	7,700		2,100	750	9						6,700		670	7	0
29	9,812	7	20		12	99	96	8,000		3,300	1,100	11						6,700		670	7	0
30	10,441	7	20		12	99	97	9,800		4,400	1,400	14						7,030		670	20	3
Mean	10,675	9	15		10	99	96	7,770		3,300	950	8						2,630		1,010	9.8	0.8
Dec., 1923																						
1	9,961	7	17		10	99	96	5,200		2,200	900	5						3,300		330	33	0
2	9,431	7	16		10	100	98	7,000		3,100	1,100	10						3,630		670	33	0
3	10,906	7	15		10	100	99	6,900		3,000	800	35						3,630		330	33	2
4	10,942	7	15		10	101	95	5,800		2,400	900	3						670		330	67	0
5	10,996	7	15		10	97	96	7,500		3,000	900	6						3,360		330	67	2
6	10,887	7	15		10	99	97	9,000		5,500	850	5						670		330	33	1
7	11,005	7	17		10	98	97	14,000		8,000	2,800	27						3,630		330	33	0
8	10,731	7	78		18	100	98	8,400		4,000	1,800	9						3,970		330	33	0
9	9,879	7	42		15	100	98	8,000		3,900	1,200	10						3,970		330	33	0
10	11,119	7	20		12	101	99	7,900		2,900	800	6						3,630		3,630	67	0
11	10,454	7	15		12	100	97	8,000		3,700	1,000	5						670		330	67	0
12	10,812	6	15		12	98	98	6,000		2,600	900	11						3,300		330	33	0
13	10,629	6	32		25	95	94	6,200		2,500	900	4						670		330	67	0
14	10,465	6	31		17	102	99	3,600		1,600	500	8						670		670	33	0
15	10,654	6	22		17	100	97	5,300		2,100	700	4						3,630		670	67	0
16	9,761	6	36		17	101	99	6,600		2,200	900	7						3,630		670	67	0
17	11,584	6	53		18	101	95	6,400		2,600	1,100	9						3,970		6,700	33	1
18	10,932	5	29		15	100	92	8,200		2,200	800	6						7,030		330	33	0
19	10,705	5	17		10	99	96	9,400		4,800	1,000	8						3,630		670	33	0
20	10,549	5	12		10	101	99	9,600		5,400	800	6						1,000		670	67	0
21	10,961	5	12		10	101	95	8,500		5,400	2,500	22						6,700		670	67	0
22	10,445	5	12		10	97	93	7,500		2,800	1,000	15						670		330	33	0
23	9,271	5	11		10	98	95	8,800		4,200	1,300	13						3,970		330	33	0
24	10,306	5	10		10	99	98	7,600		2,900	900	3						3,970		1,000	100	0
25	8,992	5	11		10	100	95	8,700		3,600	1,100	11						7,030		1,000	67	0
26	10,677	4	12		7	100	99	8,700		3,800	1,000	6						3,970		6,700	67	1
27	10,895	4	15		5	98	97	6,700		3,300	1,600	9						6,700		670	33	0
28	11,009	4	28		17	99	94	12,000		5,800	1,600	14						3,630		330	33	0
29	10,592	4	34		17	102	99	10,000		6,600	2,800	18						6,700		330	67	2
30	9,819	4	31		16	101	98	8,500		4,400	1,300	10						7,030		330	67	0
31	10,695	4	28		15	100	98	8,000		4,000	1,200	5						3,630		670	33	1
Mean	10,519	6	23		13	100	97	7,910		3,720	1,200	10						3,650		991	49	0.3
Jan., 1924																						
1	9,635	3	88		22	98	93	9,400		4,600	1,600	7						6,700		330	33	0
2	10,882	3	80		20	98	94	11,000		4,100	1,000	9						6,700		330	67	0
3	11,012	3	35		15	99	95	8,200		5,900	2,000	17						3,970		330	67	0
4	10,762	3	28		15	99	97	9,000		4,300	850	11						7,030		670	67	0
5	11,585	2	26		16	101	98	9,000		6,000	1,300	13						6,700		330	67	0
6	10,554	2	54		18	100	98	10,000		5,700	1,400	7						7,030		670	67	0

***Summary of daily laboratory results reported from each individual plant, located elsewhere than on the Ohio River, included in the survey of 1923–24*—Continued**

NIAGARA FALLS (N. Y.) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Jan., 1924	*1,000 gallons*	° *C.*																				
7	11,716	1	78	......	19	97	96	10,500	......	4,800	900	4	......	......	......	......	......	10,000	......	670	67	1
8	11,161	1	93	......	31	100	96	9,300	......	5,500	600	14	......	......	......	......	......	3,970	......	670	67	0
9	10,801	1	77	......	22	99	95	7,100	......	4,000	800	17	......	......	......	......	......	6,700	......	670	33	1
10	10,491	1	48	......	17	99	97	8,800	......	2,900	800	9	......	......	......	......	......	7,030	......	670	67	1
11	10,671	1	45	......	17	93	91	5,500	......	3,700	800	21	......	......	......	......	......	6,700	......	3,630	67	2
12	10,594	1	233	......	38	103	99	8,800	......	2,500	900	17	......	......	......	......	......	7,030	......	670	67	2
13	9,411	1	160	......	26	101	98	9,800	......	4,400	900	12	......	......	......	......	......	7,030	......	670	33	0
14	11,410	1	71	......	21	100	95	7,000	......	2,000	600	12	......	......	......	......	......	7,030	......	670	33	0
15	10,982	1	53	......	17	101	95	10,000	......	4,500	1,100	5	......	......	......	......	......	3,970	......	330	33	0
16	11,094	1	76	......	35	94	90	9,800	......	5,700	900	7	......	......	......	......	......	7,030	......	330	33	1
17	13,169	1	113	......	66	96	94	26,000	......	13,000	500	5	......	......	......	......	......	6,700	......	3,300	67	0
18	11,024	1	87	......	20	95	92	10,800	......	5,700	2,100	26	......	......	......	......	......	6,700	......	670	67	0
19	10,764	1	40	......	15	97	93	9,500	......	6,000	1,100	6	......	......	......	......	......	6,700	......	3,630	67	0
20	10,234	1	44	......	18	95	93	10,600	......	6,200	1,000	6	......	......	......	......	......	7,030	......	3,300	33	0
21	12,719	1	55	......	24	95	93	14,000	......	7,800	2,000	7	......	......	......	......	......	7,030	......	670	33	0
22	13,500	1	45	......	17	97	94	7,800	......	3,000	1,100	7	......	......	......	......	......	3,630	......	670	67	0
23	12,224	1	31	......	17	93	92	9,500	......	6,000	1,000	6	......	......	......	......	......	3,630	......	670	67	0
24	12,625	1	26	......	15	103	99	9,000	......	4,100	900	11	......	......	......	......	......	3,630	......	670	67	0
25	12,408	1	25	......	15	100	97	11,300	......	5,900	1,600	8	......	......	......	......	......	3,630	......	670	33	1
26	12,766	1	23	......	12	101	97	5,700	......	3,700	550	6	......	......	......	......	......	3,970	......	3,300	33	0
27	12,857	1	20	......	11	97	93	9,200	......	3,500	700	6	......	......	......	......	......	7,030	......	3,300	33	0
28	13,811	1	20	......	10	94	93	8,700	......	3,700	1,200	18	......	......	......	......	......	7,030	......	3,630	67	2
29	12,148	1	25	......	10	100	98	9,400	......	4,200	1,000	11	......	......	......	......	......	7,030	......	3,630	67	6
30	11,769	1	20	......	10	99	95	10,800	......	5,800	3,000	32	......	......	......	......	......	3,970	......	3,630	67	2
31	11,631	1	20	......	10	102	99	14,000	......	8,000	3,600	53	......	......	......	......	......	3,970	......	670	67	4
Mean	11,497	1	60	......	20	98	95	9,980	......	5,240	1,220	12	......	......	......	......	......	6,000	......	1,750	55	0.8

Feb., 1924																						
1	11,219	2	20	------	10	93	91	12,000	------	6,600	2,400	45	------	------	------	------	------	7,080	------	1,000	100	6
2	11,351	2	20	------	10	97	96	9,500	------	4,400	1,800	44	------	------	------	------	------	3,970	------	6,700	67	1
3	10,412	2	20	------	10	98	95	11,000	------	4,100	1,200	17	------	------	------	------	------	10,000	------	3,970	100	0
4	12,276	1	20	------	10	100	95	12,800	------	6,900	2,100	22	------	------	------	------	------	10,000	------	3,630	100	4
5	12,514	2	20	------	10	97	93	13,700	------	8,900	3,000	124	------	------	------	------	------	7,030	------	1,000	67	7
6	11,192	1	25	------	15	94	94	9,700	------	5,000	1,500	23	------	------	------	------	------	3,970	------	670	67	1
7	11,096	1	20	------	10	96	95	6,500	------	2,500	800	15	------	------	------	------	------	6,700	------	1,000	67	0
8	11,269	1	20	------	10	99	96	9,600	------	4,100	1,000	21	------	------	------	------	------	7,030	------	3,630	100	8
9	11,602	1	20	------	10	93	92	9,200	------	6,500	1,200	18	------	------	------	------	------	3,970	------	670	67	4
10	10,402	1	20	------	10	94	92	8,400	------	3,000	1,400	12	------	------	------	------	------	7,030	------	670	67	0
11	12,638	1	20	------	10	97	95	8,000	------	2,800	800	19	------	------	------	------	------	3,970	------	670	100	3
12	11,786	1	20	------	10	98	95	8,400	------	3,900	1,100	21	------	------	------	------	------	3,970	------	670	67	3
13	11,637	1	15	------	10	100	89	8,900	------	5,100	1,200	16	------	------	------	------	------	6,700	------	1,000	67	1
14	11,857	1	15	------	10	99	96	9,400	------	4,400	1,800	36	------	------	------	------	------	3,970	------	670	67	0
15	11,627	1	15	------	10	99	95	9,800	------	4,200	1,400	17	------	------	------	------	------	3,970	------	3,630	67	1
16	11,652	1	15	------	10	94	91	11,000	------	5,200	2,000	28	------	------	------	------	------	6,700	------	670	67	2
17	10,790	1	15	------	10	97	95	15,000	------	8,200	3,100	25	------	------	------	------	------	10,000	------	3,970	67	2
18	12,094	1	15	------	10	99	97	12,800	------	5,400	1,900	42	------	------	------	------	------	7,030	------	1,000	100	4
19	11,854	1	15	------	10	96	94	17,000	------	11,000	4,000	12	------	------	------	------	------	3,970	------	3,630	67	3
20	12,246	1	15	------	10	98	96	10,300	------	5,100	2,200	11	------	------	------	------	------	3,970	------	670	67	0
21	11,988	1	15	------	10	103	96	9,000	------	4,100	1,800	9	------	------	------	------	------	6,700	------	670	33	0
22	12,431	1	15	------	10	101	95	7,400	------	2,400	800	10	------	------	------	------	------	6,700	------	3,630	33	0
23	11,791	1	15	------	10	100	98	6,100	------	1,600	500	8	------	------	------	------	------	3,970	------	330	33	0
24	11,225	1	15	------	10	100	97	8,900	------	3,100	900	12	------	------	------	------	------	3,970	------	330	33	0
25	11,952	1	15	------	10	99	95	8,200	------	2,400	750	4	------	------	------	------	------	3,970	------	3,300	100	0
26	11,764	1	25	------	15	101	96	9,500	------	3,200	900	9	------	------	------	------	------	3,970	------	330	67	2
27	11,723	1	31	------	15	101	99	7,100	------	2,200	500	5	------	------	------	------	------	3,970	------	3,300	33	0
28	11,668	1	20	------	10	97	94	8,400	------	3,800	1,000	15	------	------	------	------	------	7,030	------	670	33	0
29	11,652	1	15	------	10	98	95	8,300	------	3,400	1,400	31	------	------	------	------	------	3,970	------	330	67	2
Mean	11,645	1	18	------	10	98	95	9,880	------	4,640	1,530	23	------	------	------	------	------	5,800	------	1,820	68	1.9
March, 1924																						
1	11,198	1	10	------	5	92	90	9,500	------	4,000	3,200	28	------	------	------	------	------	3,970	------	330	67	1
2	10,334	1	10	------	5	95	93	11,000	------	5,200	1,100	12	------	------	------	------	------	7,030	------	870	67	0
3	11,634	1	10	------	6	103	96	14,000	------	6,200	2,400	5	------	------	------	------	------	7,030	------	1,000	100	1
4	11,824	1	10	------	7	101	98	12,200	------	6,200	1,500	7	------	------	------	------	------	6,700	------	330	67	0
5	11,514	1	10	------	7	98	95	10,500	------	6,900	1,200	9	------	------	------	------	------	3,970	------	670	67	1
6	11,528	1	10	------	7	100	95	9,600	------	5,000	900	20	------	------	------	------	------	7,030	------	670	67	3
7	11,347	1	20	------	5	103	97	18,000	------	11,500	4,600	33	------	------	------	------	------	3,970	------	670	67	2
8	11,382	1	15	------	10	97	95	14,000	------	8,000	3,500	20	------	------	------	------	------	3,970	------	670	67	1
9	10,651	1	15	------	10	98	94	9,800	------	3,000	1,000	18	------	------	------	------	------	7,030	------	670	100	0
10	12,086	1	10	------	5	99	97	19,000	------	9,500	3,000	18	------	------	------	------	------	7,030	------	7,030	100	1
11	11,881	1	10	------	5	100	95	7,900	------	3,000	900	14	------	------	------	------	------	3,970	------	1,000	67	1
12	11,981	1	10	------	5	102	95	11,200	------	6,500	2,400	26	------	------	------	------	------	3,630	------	670	67	1
13	11,739	1	10	------	5	97	92	10,800	------	3,500	1,200	9	------	------	------	------	------	3,300	------	3,630	67	0
14	11,511	1	15	------	10	95	92	8,800	------	3,000	900	48	------	------	------	------	------	6,700	------	1,000	67	3
15	11,381	1	15	------	10	93	91	15,000	------	8,000	2,800	43	------	------	------	------	------	3,300	------	3,630	67	1
16	11,001	1	15	------	10	97	94	11,000	------	5,500	1,500	6	------	------	------	------	------	7,030	------	3,630	67	0
17	13,494	1	15	------	10	100	94	9,700	------	4,500	1,800	6	------	------	------	------	------	6,700	------	3,630	67	0

Summary of daily laboratory results reported from each individual plant, located elsewhere than on the Ohio River, included in the survey of 1923–24—Continued

NIAGARA FALLS (N. Y.) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
March, 1924	*1,000 gallons*	*° C.*																				
18	12, 137	1	15	------	10	94	89	11, 500	------	5, 000	1, 500	7	------	------	------	------	------	7, 030	------	3, 970	100	0
19	11, 272	1	10	------	7	97	94	12, 000	------	7, 000	2, 400	5	------	------	------	------	------	3, 970	------	670	67	0
20	11, 474	1	10	------	5	101	95	8, 500	------	2, 400	650	15	------	------	------	------	------	3, 970	------	1, 000	67	0
21	11, 294	1	10	------	5	93	90	12, 000	------	7, 000	2, 700	45	------	------	------	------	------	7, 030	------	1, 000	67	2
22	11, 354	2	15	------	10	96	94	11, 500	------	4, 500	1, 000	11	------	------	------	------	------	3, 970	------	3, 630	67	1
23	12, 255	2	15	------	10	95	94	14, 500	------	8, 500	4, 000	80	------	------	------	------	------	7, 030	------	3, 970	67	4
24	10, 244	2	15	------	10	95	94	12, 500	------	4, 000	1, 600	10	------	------	------	------	------	7, 030	------	3, 630	100	0
25	11, 909	2	15	------	10	97	95	9, 500	------	4, 500	1, 200	18	------	------	------	------	------	7, 030	------	3, 970	100	3
26	11, 177	2	20	------	10	96	93	12, 800	------	6, 000	2, 100	6	------	------	------	------	------	3, 970	------	3, 630	67	0
27	11, 235	2	20	------	15	98	96	22, 000	------	12, 500	5, 400	8	------	------	------	------	------	6, 700	------	670	67	1
28	11, 217	2	20	------	15	100	96	29, 000	------	18, 500	7, 000	26	------	------	------	------	------	7, 030	------	1, 000	67	6
29	10, 921	2	20	------	12	94	93	34, 000	------	24, 000	8, 800	44	------	------	------	------	------	10, 000	------	670	67	1
30	9, 978	2	115	------	88	96	95	16, 500	------	4, 500	2, 800	19	------	------	------	------	------	7, 030	------	670	100	0
31	11, 632	2	60	------	27	97	94	18, 500	------	11, 000	4, 500	37	------	------	------	------	------	7, 030	------	3, 630	100	3
Mean	11, 438	1	18	------	12	97	94	13, 200	------	7, 000	2, 600	21	------	------	------	------	------	5, 840	------	2, 010	76	1. 2
April, 1924																						
1	10, 957	1	25	------	15	100	96	10, 500	------	6, 400	2, 800	23	------	------	------	------	------	39, 700	------	3, 630	33	2
2	11, 350	2	25	------	15	101	96	9, 500	------	3, 900	1, 800	10	------	------	------	------	------	39, 700	------	670	67	1
3	11, 248	1	22	------	15	99	95	12, 000	------	7, 500	3, 400	35	------	------	------	------	------	39, 700	------	1, 000	67	0
4	11, 228	1	17	------	12	103	96	10, 000	------	5, 400	2, 200	52	------	------	------	------	------	70, 300	------	1, 000	67	2
5	10, 891	1	15	------	10	95	93	11, 500	------	6, 500	3, 200	28	------	------	------	------	------	39, 700	------	670	100	0
6	10, 061	1	20	------	15	100	95	12, 000	------	6, 000	3, 400	16	------	------	------	------	------	39, 700	------	670	100	0
7	11, 567	1	23	------	15	103	95	15, 000	------	8, 000	2, 900	19	------	------	------	------	------	36, 300	------	670	67	1
8	10, 989	1	25	------	15	95	93	9, 800	------	4, 000	1, 200	11	------	------	------	------	------	70, 300	------	3, 970	100	2
9	10, 749	1	20	------	12	98	94	11, 000	------	5, 000	1, 500	8	------	------	------	------	------	70, 300	------	3, 970	67	0
10	10, 902	1	20	------	12	97	96	10, 000	------	5, 000	1, 600	9	------	------	------	------	------	39, 700	------	3, 970	67	0
11	10, 842	1	20	------	15	94	92	10, 500	------	7, 000	1, 400	10	------	------	------	------	------	70, 300	------	1, 000	67	0
12	10, 632	1	15	------	10	96	94	12, 400	------	6, 500	1, 100	16	------	------	------	------	------	39, 700	------	670	67	0

13......	10, 184	1	17	......	10	98	95	12, 000	....	6, 000	1, 400	10	....	....	....	....	....	39, 700	....	670	67	0
14......	11, 756	1	20	......	12	101	96	15, 000	....	7, 000	1, 600	11	....	....	....	....	....	100, 000	....	7, 030	100	1
15......	11, 252	1	17	......	10	96	92	11, 500	....	5, 000	1, 500	14	....	....	....	....	....	10, 000	....	1, 000	100	0
16......	11, 341	1	15	......	10	99	97	15, 000	....	7, 000	1, 100	12	....	....	....	....	....	39, 700	....	670	100	0
17......	11, 047	1	15	......	10	100	96	14, 000	....	6, 500	2, 200	23	....	....	....	....	....	39, 700	....	1, 000	67	0
18......	11, 074	1	15	......	10	97	96	9, 400	....	3, 500	900	20	....	....	....	....	....	10, 000	....	1, 000	100	1
19......	11, 172	1	15	......	10	96	94	8, 600	....	2, 500	850	11	....	....	....	....	....	39, 700	....	670	67	0
20......	9, 776	1	15	......	10	98	94	8, 500	....	3, 000	900	9	....	....	....	....	....	39, 700	....	670	67	0
21......	11, 191	1	20	......	10	101	96	9, 500	....	4, 000	1, 000	11	....	....	....	....	....	39, 700	....	3, 970	67	1
22......	11, 657	1	114	......	68	103	98	9, 500	....	....	1, 100	14	....	....	....	....	....	39, 700	....	....	100	4
23......	11, 469	1	105	......	68	102	91	12, 000	....	5, 500	3, 000	35	....	....	....	....	....	39, 700	....	670	67	4
24......	11, 601	1	65	......	32	90	86	12, 500	....	5, 500	2, 200	18	....	....	....	....	....	39, 700	....	670	67	1
25......	11, 429	1	55	......	16	93	91	15, 000	....	8, 000	3, 800	43	....	....	....	....	....	39, 700	....	670	100	3
26......	11, 281	2	32	......	15	91	90	12, 500	....	7, 500	3, 000	24	....	....	....	....	....	39, 700	....	1, 000	67	1
27......	11, 031	2	20	......	12	90	88	9, 500	....	5, 500	2, 000	11	....	....	....	....	....	39, 700	....	1, 000	67	0
28......	12, 419	2	20	......	12	90	89	7, 500	....	3, 500	1, 200	13	....	....	....	....	....	6, 700	....	670	100	1
29......	11, 169	3	25	......	15	96	93	9, 500	....	3, 500	1, 000	12	....	....	....	....	....	39, 700	....	1, 000	100	1
30......	11, 219	3	20	......	10	90	86	11. 000	....	5, 500	1, 100	10	....	....	....	....	....	10, 000	....	670	67	1
Mean	11, 116	1	28	......	17	97	93	11, 300	....	5, 600	1, 800	18	....	....	....	....	....	41, 600	....	1, 550	78	0. 9
May, 1924																						
1......	12, 415	3	20	......	10	92	88	11, 000	....	4, 000	1, 800	16	....	....	....	....	....	3, 970	....	3, 970	67	0
2......	11, 258	4	31	......	18	90	89	8, 500	....	4, 000	1, 800	29	....	....	....	....	....	1, 000	....	670	67	1
3......	10, 816	5	25	......	15	91	90	7, 600	....	2, 600	1, 200	8	....	....	....	....	....	3, 970	....	1, 000	67	0
4......	10, 2[illegible]7	5	25	......	15	91	90	8, 600	....	2, 400	1, 100	4	....	....	....	....	....	3, 970	....	1, 000	67	0
5......	12, 684	5	60	......	20	94	92	10, 000	....	5, 500	1, 900	6	....	....	....	....	....	3, 970	....	3, 630	33	0
6......	11, 451	5	25	......	15	93	90	9, 600	....	4, 200	1, 400	10	....	....	....	....	....	3, 970	....	670	100	1
7......	11, 604	6	23	......	10	91	88	9, 500	....	4, 200	1, 500	10	....	....	....	....	....	3, 970	....	1, 000	100	1
8......	11, 752	6	20	......	10	96	94	12, 300	....	5, 100	2, 200	8	....	....	....	....	....	3, 970	....	3, 970	100	0
9......	11, 309	6	15	......	10	92	91	12, 400	....	5, 600	2, 500	6	....	....	....	....	....	1, 000	....	670	67	0
10......	11, 512	6	15	......	10	94	91	16, 000	....	8, 000	3, 400	23	....	....	....	....	....	3, 970	....	1, 000	100	0
11......	10, 457	6	15	......	10	94	91	17, 000	....	7, 500	3, 000	17	....	....	....	....	....	3, 970	....	1, 000	100	0
12......	12, 524	6	15	......	10	90	89	15, 500	....	7, 000	1, 900	13	....	....	....	....	....	3, 630	....	3, 630	100	1
13......	12, 929	6	15	......	10	99	91	19, 000	....	11, 000	4, 000	11	....	....	....	....	....	3, 970	....	670	100	2
14......	11, 541	6	15	......	10	95	92	18, 000	....	9, 000	2, 000	27	....	....	....	....	....	6, 700	....	1, 000	67	1
15......	11, 311	7	17	......	10	94	90	9, 700	....	4, 300	1, 600	14	....	....	....	....	....	3, 970	....	670	67	1
16......	11, 368	7	47	......	25	98	94	14, 500	....	6, 000	1, 700	19	....	....	....	....	....	3, 970	....	1, 000	100	2
17......	11, 357	7	39	......	23	97	94	15, 000	....	8, 400	3, 500	28	....	....	....	....	....	3, 970	....	3, 970	100	2
18......	10, 653	7	38	......	15	97	91	16, 800	....	7, 000	3, 000	28	....	....	....	....	....	3, 970	....	3, 970	100	0
19......	11, 712	8	33	......	16	95	92	16, 000	....	7, 000	1, 200	12	....	....	....	....	....	7, 030	....	3, 970	33	0
20......	11, 992	8	30	......	16	97	92	14, 000	....	6, 500	1, 100	23	....	....	....	....	....	7, 030	....	3, 970	67	1
21......	11, 823	8	25	......	15	96	94	11, 000	....	6, 200	1, 500	16	....	....	....	....	....	3, 970	....	3, 630	67	0
22......	11, 890	9	20	......	15	93	91	9, 800	....	4, 900	950	13	....	....	....	....	....	7, 030	....	3, 970	67	1
23......	11, 683	9	20	......	13	94	89	11, 000	....	5, 400	1, 900	21	....	....	....	....	....	3, 970	....	670	67	3
24......	12, 488	9	20	......	13	92	89	12, 000	....	6, 000	2, 200	22	....	....	....	....	....	7, 030	....	6, 700	100	1
25......	9, 373	9	20	......	15	92	89	9, 000	....	2, 900	1, 600	16	....	....	....	....	....	7, 030	....	6, 700	100	0
26......	12, 346	9	32	......	15	97	94	8, 200	....	3, 400	1, 200	13	....	....	....	....	....	3, 970	....	670	33	0
27......	11, 935	9	28	......	15	94	91	10, 000	....	6, 900	1, 000	8	....	....	....	....	....	7, 030	....	3, 970	33	0
28......	12, 273	9	20	......	10	93	89	8, 900	....	5, 300	900	10	....	....	....	....	....	3, 970	....	670	33	1

Summary of daily laboratory results reported from each individual plant, located elsewhere than on the Ohio River, included in the survey of 1923–24—Continued

NIAGARA FALLS (N. Y.) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
May, 1924	*1,000 gallons*	*° C.*																				
29	12, 150	9	15	------	10	97	89	8, 500	------	3, 900	850	13	------	------	------	------	------	7, 030	------	3, 630	67	1
30	11, 539	9	15	------	10	97	89	9, 200	------	3, 500	1, 100	13	------	------	------	------	------	7, 030	------	3, 630	67	0
31	11, 675	9	15	------	10	99	90	8, 800	------	3, 600	1, 000	35	------	------	------	------	------	7, 030	------	670	33	0
Mean	11, 596	7	24	------	14	94	91	11, 850	------	5, 550	1, 800	16	------	------	------	------	------	4, 760	------	2, 470	73	0. 7
June, 1924																						
1	10, 871	11	15	------	10	94	89	9, 400	------	4, 000	850	4	------	------	------	------	------	7, 030	------	3, 970	100	0
2	12, 763	11	15	------	10	92	89	8, 800	------	6, 100	1, 100	7	------	------	------	------	------	7, 030	------	3, 970	100	0
3	12, 491	11	13	------	10	93	90	10, 800	------	4, 000	950	6	------	------	------	------	------	6, 700	------	670	67	0
4	12, 306	11	10	------	5	95	92	6, 900	------	3, 000	1, 000	11	------	------	------	------	------	3, 970	------	6, 700	67	0
5	12, 498	11	10	------	5	97	94	8, 000	------	3, 300	900	6	------	------	------	------	------	3, 970	------	670	33	0
6	12, 680	11	10	------	5	98	96	9, 500	------	5, 000	1, 100	10	------	------	------	------	------	3, 970	------	3, 630	67	1
7	12, 159	11	10	------	5	91	89	11, 200	------	6, 800	1, 500	10	------	------	------	------	------	7, 030	------	6, 700	33	0
8	10, 829	12	10	------	5	93	89	9, 900	------	4, 500	1, 900	7	------	------	------	------	------	7, 030	------	3, 630	67	0
9	12, 978	12	10	------	5	92	90	12, 600	------	5, 200	2, 000	21	------	------	------	------	------	10, 000	------	3, 970	100	0
10	13, 078	12	10	------	5	94	92	12, 200	------	6, 200	2, 400	10	------	------	------	------	------	7, 030	------	3, 970	100	0
11	12, 760	12	10	------	5	91	89	9, 400	------	5, 200	850	5	------	------	------	------	------	3, 970	------	6, 700	100	0
12	12, 809	13	10	------	5	96	91	8, 900	------	4, 100	650	5	------	------	------	------	------	7, 030	------	670	100	0
13	12, 802	13	10	------	5	97	92	14, 000	------	8, 400	3, 800	57	------	------	------	------	------	3, 970	------	3, 630	100	2
14	13, 123	13	10	------	5	95	91	12, 400	------	6, 200	2, 600	33	------	------	------	------	------	7, 030	------	1, 000	100	1
15	11, 183	13	10	------	5	94	92	11, 200	------	6, 600	1, 100	11	------	------	------	------	------	7, 030	------	670	67	0
16	12, 505	14	15	------	5	93	91	11, 000	------	6, 500	1, 200	24	------	------	------	------	------	10, 000	------	7, 030	100	3
17	14, 412	14	15	------	5	96	90	8, 500	------	4, 000	1, 000	11	------	------	------	------	------	7, 030	------	1, 000	67	1
18	13, 229	14	10	------	5	99	96	8, 100	------	4, 200	650	4	------	------	------	------	------	3, 970	------	3, 630	67	0
19	14, 356	14	7	------	5	92	89	8, 400	------	3, 000	1, 100	6	------	------	------	------	------	7, 030	------	3, 970	67	0
20	13, 930	15	7	------	5	97	90	9, 800	------	4, 200	1, 800	22	------	------	------	------	------	3, 970	------	3, 630	67	0
21	12, 501	15	10	------	5	94	91	9, 000	------	4, 900	2, 100	10	------	------	------	------	------	6, 700	------	670	33	0
22	11, 993	15	10	------	5	96	90	11, 000	------	6, 900	1, 000	10	------	------	------	------	------	3, 970	------	670	67	0
23	13, 589	16	10	------	5	95	92	8, 800	------	2, 600	1, 000	10	------	------	------	------	------	7, 030	------	3, 970	100	3
24	13, 400	16	12	------	5	92	89	9, 200	------	4, 100	2, 000	6	------	------	------	------	------	7, 030	------	3, 970	100	0

25	13,875	16	10	------	5	97	95	11,500	---------	5,500	2,400	7	---------	-------	-------	-------	-------	3,970	-------	1,000	67	0
26	12,547	16	7	------	5	94	92	14,400	---------	8,000	3,400	7	---------	-------	-------	-------	-------	10,000	-------	3,970	67	0
27	13,558	16	7	------	5	96	92	12,400	---------	6,600	2,900	34	---------	-------	-------	-------	-------	7,030	-------	3,630	100	1
28	12,884	17	10	------	5	91	89	10,300	---------	4,600	2,000	11	---------	-------	-------	-------	-------	3,970	-------	1,000	67	0
29	11,809	17	10	------	5	96	90	15,000	---------	8,900	3,700	5	---------	-------	-------	-------	-------	10,000	-------	7,030	100	0
30	13,638	18	10	------	5	95	92	11,100	---------	5,000	2,200	4	---------	-------	-------	-------	-------	7,030	-------	670	100	0
Mean	12,800	14	11	------	5	94	91	10,000	---------	5,000	1,600	13	---------	-------	-------	-------	-------	6,380	-------	3,250	79	0.4
July, 1924																						
1	13,695	18	12	------	5	96	92	15,000	---------	9,000	3,600	5	1	-------	-------	-------	-------	10,000	-------	7,030	100	0
2	13,852	18	10	------	5	93	91	8,300	---------	2,100	1,200	21	---------	-------	-------	-------	-------	7,030	-------	3,970	100	3
3	13,711	18	10	------	5	92	90	10,200	---------	4,400	1,900	18	---------	-------	-------	-------	-------	3,970	-------	3,630	67	1
4	12,805	18	10	------	5	92	90	9,900	---------	4,300	900	8	---------	-------	-------	-------	-------	3,970	-------	670	33	0
5	13,443	18	10	------	5	94	89	12,000	---------	6,000	1,500	9	---------	-------	-------	-------	-------	7,030	-------	3,630	67	0
6	11,799	19	10	------	5	95	91	8,900	---------	3,900	800	8	---------	-------	-------	-------	-------	7,030	-------	670	33	0
7	13,358	19	10	------	5	95	93	9,600	---------	4,000	900	10	---------	-------	-------	-------	-------	7,030	-------	1,000	67	0
8	13,313	19	10	------	5	92	89	9,400	---------	3,900	1,000	16	---------	-------	-------	-------	-------	7,030	-------	6,700	67	0
9	13,483	19	10	------	5	94	89	11,000	---------	6,000	1,100	13	---------	-------	-------	-------	-------	3,970	-------	1,000	33	0
10	12,964	19	15	------	7	91	89	9,900	---------	4,500	1,500	10	---------	-------	-------	-------	-------	3,970	-------	3,630	33	0
11	13,375	19	15	------	10	96	91	10,000	---------	7,000	900	11	---------	-------	-------	-------	-------	3,970	-------	670	100	1
12	13,564	19	15	------	7	93	88	11,500	---------	5,700	1,900	6	---------	-------	-------	-------	-------	10,000	-------	3,970	67	0
13	11,632	19	10	------	6	93	89	9,900	---------	4,900	1,100	9	---------	-------	-------	-------	-------	7,030	-------	670	33	0
14	13,761	20	10	------	5	93	91	11,500	---------	5,200	2,200	11	---------	-------	-------	-------	-------	10,000	-------	3,970	100	1
15	13,746	20	10	------	5	92	89	12,000	---------	6,000	2,600	6	---------	-------	-------	-------	-------	7,030	-------	1,000	100	0
16	13,251	20	10	------	5	95	90	9,600	---------	5,900	950	9	---------	-------	-------	-------	-------	7,030	-------	1,000	67	1
17	12,681	20	10	------	5	92	90	10,000	---------	5,300	1,000	12	---------	-------	-------	-------	-------	3,970	-------	3,630	100	1
18	12,971	20	10	------	5	96	94	8,800	---------	3,500	800	6	---------	-------	-------	-------	-------	3,970	-------	670	67	0
19	13,541	20	12	------	7	97	95	9,100	---------	4,300	900	8	---------	-------	-------	-------	-------	3,630	-------	670	67	0
20	11,802	21	11	------	6	95	91	9,800	---------	5,000	1,000	6	---------	-------	-------	-------	-------	3,630	-------	1,000	33	0
21	15,071	21	10	------	5	91	90	11,000	---------	4,500	1,100	11	---------	-------	-------	-------	-------	7,030	-------	1,000	33	1
22	14,351	21	7	------	5	94	91	9,200	---------	5,900	1,500	8	---------	-------	-------	-------	-------	7,030	-------	3,630	33	1
23	15,261	21	7	------	5	96	95	8,900	---------	4,200	900	7	---------	-------	-------	-------	-------	10,000	-------	3,630	67	1
24	15,832	21	7	------	5	99	97	12,000	---------	6,900	1,800	5	---------	-------	-------	-------	-------	6,700	-------	3,970	100	0
25	15,006	21	7	------	5	95	92	9,900	---------	7,000	850	10	---------	-------	-------	-------	-------	3,630	-------	3,970	67	1
26	14,584	21	7	------	5	97	91	10,200	---------	6,500	1,000	9	---------	-------	-------	-------	-------	7,030	-------	1,000	33	0
27	12,209	21	7	------	5	96	91	10,500	---------	6,400	950	4	---------	-------	-------	-------	-------	3,970	-------	670	33	0
28	14,077	21	7	------	5	94	92	10,000	---------	5,800	1,400	6	---------	-------	-------	-------	-------	3,620	-------	670	33	0
29	14,515	21	7	------	5	95	95	9,500	---------	5,100	950	6	---------	-------	-------	-------	-------	7,030	-------	3,630	33	0
30	13,153	21	7	------	5	92	91	9,700	---------	6,400	1,000	5	---------	-------	-------	-------	-------	3,970	-------	3,970	67	1
31	12,811	21	7	------	5	96	94	10,800	---------	6,200	1,200	4	---------	-------	-------	-------	-------	7,030	-------	6,700	67	0
Mean	13,512	20	10	------	5	94	91	10,300	---------	5,400	1,300	8	---------	-------	-------	-------	-------	6,080	-------	2,170	61	0.4
Aug., 1924																						
1	13,124	21	10	------	5	96	92	8,900	---------	6,300	1,000	6	---------	-------	-------	-------	-------	7,030	-------	670	67	1
2	13,703	21	10	------	5	94	92	9,800	---------	4,400	900	8	---------	-------	-------	-------	-------	3,970	-------	1,000	100	0
3	12,315	21	10	------	5	94	91	9,400	---------	4,100	1,600	27	---------	-------	-------	-------	-------	3,970	-------	670	67	0
4	14,172	21	5	------	3	90	87	6,800	---------	2,400	900	11	---------	-------	-------	-------	-------	7,030	-------	3,970	67	1
5	13,701	21	5	------	3	93	91	9,200	---------	4,600	2,000	30	---------	-------	-------	-------	-------	7,030	-------	3,630	100	1
6	14,500	21	5	------	3	92	90	7,900	---------	5,900	1,100	7	---------	-------	-------	-------	-------	7,030	-------	670	67	0

Summary of daily laboratory results reported from each individual plant, located elsewhere than on the Ohio River, included in the survey of 1923–24—Continued

NIAGARA FALLS (N. Y.) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Aug., 1924	*1,000 gallons*	° *C.*																				
7	14,043	21	5	------	3	91	90	6,000	------	2,800	1,600	4	------	------	------	------	------	3,970	------	3,630	67	0
8	13,081	21	15	------	10	96	94	9,400	------	4,400	1,800	8	------	------	------	------	------	7,030	------	1,000	67	1
9	12,521	21	15	------	10	95	92	10,500	------	4,900	1,500	22	------	------	------	------	------	3,970	------	3,630	33	1
10	11,322	21	15	------	10	96	93	9,700	------	4,100	900	7	------	------	------	------	------	3,970	------	670	33	0
11	13,113	21	15	------	10	94	92	10,000	------	4,400	1,800	14	------	------	------	------	------	7,030	------	3,970	100	1
12	13,205	21	10	------	5	93	90	11,000	------	6,200	1,200	10	------	------	------	------	------	7,030	------	6.700	100	1
13	12,849	21	10	------	5	96	93	9,900	------	5.000	900	6	------	------	------	------	------	7,030	------	3,970	100	0
14	13,339	21	10	------	5	95	92	9,500	------	4,900	900	6	------	------	------	------	------	7,030	------	7,030	100	1
15	13,434	21	10	------	5	92	96	9,500	------	4,700	1,400	39	------	------	------	------	------	7,030	------	3,970	100	2
16	12,612	21	7	------	5	91	89	10,500	------	4,800	1,600	9	------	------	------	------	------	3,970	------	1,000	67	0
17	11,499	21	7	------	5	94	89	9,000	------	4,600	1,000	6	------	------	------	------	------	3,970	------	670	100	0
18	13,517	21	7	------	5	96	90	8,800	------	4,100	1,600	6	------	------	------	------	------	7,030	------	7,030	100	1
19	13,296	21	7	------	5	92	90	9,100	------	4,500	1,000	7	------	------	------	------	------	7,030	------	1,000	100	0
20	14,022	21	5	------	3	94	92	8,900	------	4,200	1,100	7	------	------	------	------	------	3,970	------	1,000	67	0
21	11,821	21	5	------	3	93	91	19,000	------	4,900	1,500	16	------	------	------	------	------	7,030	------	1,000	33	0
22	13,051	21	5	------	3	95	93	9,300	------	3,900	1,200	12	------	------	------	------	------	3,970	------	1,000	67	0
23	13,268	21	5	------	3	97	95	8,800	------	4,200	1,500	20	------	------	------	------	------	7,030	------	3,970	33	1
24	11,901	21	5	------	3	95	92	10,000	------	4.500	1,000	9	------	------	------	------	------	7,030	------	3,630	100	1
25	14,358	21	5	------	3	93	91	11,800	------	6,700	1,500	5	------	------	------	------	------	7,030	------	3,970	100	0
26	14,181	21	5	------	3	92	91	8,900	------	3,400	1,200	7	------	------	------	------	------	3,970	------	1,000	67	0
27	14,229	21	10	------	7	94	92	9,700	------	5,000	1,000	5	------	------	------	------	------	3,970	------	3,970	67	0
28	13,531	21	10	------	7	97	95	9,800	------	4,900	1,000	9	------	------	------	------	------	7,030	------	3,970	67	0
29	14,136	21	10	------	8	96	93	10,000	------	4,700	1,000	11	------	------	------	------	------	7,030	------	670	67	2
30	14,739	21	5	------	3	93	91	9,500	------	4,600	1,000	16	------	------	------	------	------	3,970	------	670	100	1
31	12,762	21	5	------	3	95	93	9,900	------	6,100	1,200	12	------	------	------	------	------	3,970	------	670	67	0
Mean	13,237	21	8	------	5	94	91	9,700	------	4,600	1,200	12	------	------	------	------	------	5,860	------	2,570	76	0.5
Sept., 1924																						
1	13,087	20	10	------	7	96	93	8,000	------	3,500	800	11	------	------	------	------	------	7,030	------	3,970	100	0
2	13,387	20	10	------	7	93	91	11,400	------	6,400	2,800	30	------	------	------	------	------	10,000	------	7,030	67	4

3	13,501	19	10	------	5	92	90	9,900	---------	4,900	1,900	26	---------	-------	-------	-------	-------	3,970	-------	1,000	100	3
4	13,542	19	10	------	5	94	92	11,500	---------	7,000	3,100	35	---------	-------	-------	-------	-------	3,970	-------	3,630	67	1
5	13,131	19	10	------	5	92	90	13,000	---------	8,600	3,700	26	---------	-------	-------	-------	-------	3,970	-------	1,000	100	2
6	12,892	19	10	------	5	95	93	10,000	---------	5,400	2,200	11	---------	-------	-------	-------	-------	3,970	-------	3,630	67	0
7	12,097	19	10	------	5	97	93	8,900	---------	4,100	1,000	7	---------	-------	-------	-------	-------	3,970	-------	3,970	33	0
8	13,873	18	10	------	5	96	94	11,000	---------	5,900	1,100	11	---------	-------	-------	-------	-------	10,000	-------	7,030	100	1
9	13,184	18	12	------	7	94	93	9,000	---------	4,700	2,100	73	---------	-------	-------	-------	-------	7,030	-------	3,970	100	3
10	13,434	18	12	------	7	92	90	9,700	---------	5,100	1,200	13	---------	-------	-------	-------	-------	7,030	-------	3,970	100	2
11	13,254	18	12	------	7	100	98	7,600	---------	2,500	900	30	---------	-------	-------	-------	-------	7,030	-------	1,000	67	0
12	13,466	18	10	------	7	99	98	8,900	---------	3,500	1,600	11	---------	-------	-------	-------	-------	7,030	-------	3,970	67	0
13	12,729	18	10	------	7	95	93	11,000	---------	4,900	1,800	21	---------	-------	-------	-------	-------	3,970	-------	3,970	33	1
14	11,611	18	7	------	7	96	92	9,600	---------	4,700	1,000	11	---------	-------	-------	-------	-------	3,970	-------	3,630	33	0
15	13,395	18	7	------	5	94	92	14,000	---------	9,200	4,000	19	---------	-------	-------	-------	-------	3,970	-------	3,970	100	2
16	13,521	18	10	------	5	93	90	8,400	---------	3,800	1,500	9	---------	-------	-------	-------	-------	7,030	-------	1,000	67	0
17	13,201	18	10	------	5	99	95	9,800	---------	5,400	900	6	---------	-------	-------	-------	-------	3,970	-------	3,630	67	0
18	13,441	18	15	------	5	98	96	8,800	---------	3,100	900	11	---------	-------	-------	-------	-------	7,030	-------	670	33	0
19	13,221	18	15	------	5	92	89	7,500	---------	2,900	1,200	11	---------	-------	-------	-------	-------	3,970	-------	1,000	67	2
20	13,041	18	10	------	3	91	90	9,500	---------	4,500	1,900	15	---------	-------	-------	-------	-------	7,030	-------	3,970	100	0
21	11,868	18	15	------	3	97	95	8,800	---------	4,600	850	5	---------	-------	-------	-------	-------	7,030	-------	3,970	33	1
22	12,909	18	10	------	5	95	93	9,500	---------	4,100	1,200	8	---------	-------	-------	-------	-------	3,970	-------	3,630	100	0
23	13,109	17	15	------	10	98	95	9,000	---------	3,200	800	9	---------	-------	-------	-------	-------	7,030	-------	330	33	0
24	13,288	17	12	------	10	94	92	9,500	---------	3,600	1,000	12	---------	-------	-------	-------	-------	7,030	-------	3,970	67	0
25	13,392	17	10	------	7	93	91	9,500	---------	4,800	800	6	---------	-------	-------	-------	-------	3,970	-------	3,970	33	0
26	13,211	17	10	------	7	95	94	9,300	---------	3,400	1,000	9	---------	-------	-------	-------	-------	7,030	-------	3,970	100	2
27	13,278	17	10	------	7	97	93	10,500	---------	4,900	2,200	19	---------	-------	-------	-------	-------	7,030	-------	3,970	67	0
28	11,977	17	15	------	7	101	95	11,000	---------	4,900	1,400	8	---------	-------	-------	-------	-------	7,030	-------	3,630	67	0
29	13,618	17	15	------	10	96	94	9,900	---------	4,300	1,100	8	---------	-------	-------	-------	-------	3,970	-------	1,000	100	0
30	13,264	17	20	------	15	94	93	10,000	---------	5,500	2,100	35	---------	-------	-------	-------	-------	7,030	-------	1,000	100	0
Mean	13,097	18	12	------	7	95	93	9,800	---------	7,000	1,280	17	---------	-------	-------	-------	-------	5,900	-------	3,200	72	0.8

TOLEDO (OHIO) WATER FILTRATION PLANT

Aug., 1923																						
1	38,206	25	40	------	17	132	108	450	---------	125	120	120	460	-------	195	39	40	100	-------	10	0	5
2	33,359	25	40	------	18	131	118	420	---------	160	260	95	330	-------	200	40	30	100	-------	100	5	0
3	36,559	25	40	------	18	132	119	400	---------	150	120	65	400	-------	50	5	32	1,000	-------	10	0	10
4	34,404	26	45	------	17	132	121	400	---------	400	125	80	150	-------	100	25	30	1,000	-------	100	0	0
5	31,173	26	50	------	17	135	121	380	---------	700	600	60	500	-------	500	200	180	1,000	-------	100	0	0
6	35,482	26	45	------	17	138	123	350	---------	75	47	90	140	-------	40	6	42	100	-------	55	0	5
7	37,826	26	40	------	17	139	121	350	---------	65	52	65	160	-------	75	7	42	100	-------	10	0	5
8	46,665	26	45	------	17	140	126	100	---------	50	48	40	200	-------	100	11	75	100	-------	55	0	0
9	34,721	25	45	------	18	139	131	350	---------	60	70	100	100	-------	50	5	40	10	-------	10	0	0
10	36,337	25	50	------	17	143	129	500	---------	100	70	100	350	-------	50	5	12	10	-------	0	0	0
11	35,323	25	45	------	17	142	130	80	---------	30	60	30	160	-------	40	5	10	10	-------	10	0	0
12	29,589	25	40	------	15	143	135	200	---------	100	50	30	280	-------	90	6	22	10	-------	1,000	0	0
13	33,961	24	45	------	11	148	137	120	---------	10	40	70	60	-------	50	5	3	10	-------	100	0	0
14	33,054	24	75	------	10	149	140	150	---------	25	40	52	100	-------	30	4	23	50	-------	10	0	5
15	34,341	24	60	------	9	148	141	235	---------	45	40	45	160	-------	80	13	16	50	-------	10	0	5

Summary of daily laboratory results reported from each individual plant, located elsewhere than on the Ohio River, included in the survey of 1923–24—Continued

TOLEDO (OHIO) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Aug., 1923	*1,000 gallons*	° *C.*																				
16	34,436	24	55	------	10	151	142	250	------	40	26	75	410	------	40	5	50	10	------	10	0	0
17	34,404	23	55	------	14	148	142	360	------	50	45	70	250	------	20	12	30	100	------	10	0	0
18	34,943	23	60	------	17	146	139	450	------	80	60	25	400	------	110	115	10	100	------	10	0	0
19	30,697	23	60	------	14	140	130	600	------	80	26	40	560	------	100	4	30	1,000	------	10	10	0
20	36,083	23	60	------	24	146	129	160	------	120	14	17	160	------	40	4	10	100	------	10	0	0
21	36,748	23	60	------	15	147	133	310	------	75	35	55	330	------	48	26	45	100	------	10	0	5
22	40,423	21	90	------	16	146	132	500	------	170	40	100	330	------	190	16	50	550	------	10	5	0
23	31,426	21	60	------	17	146	135	380	------	175	13	35	250	------	105	11	16	50	------	5	0	0
24	32,598	20	60	------	20	145	133	450	------	150	35	45	400	------	120	30	40	100	------	10	10	0
25	33,010	19	60	------	23	146	136	320	------	40	5	40	390	------	50	8	20	10	------	10	10	0
26	27,561	19	60	------	22	145	130	300	------	150	20	4	200	------	140	2	4	100	------	10	10	0
27	32,091	20	50	------	11	148	143	560	------	410	40	50	270	------	60	6	11	100	------	10	10	10
28	31,711	20	55	------	10	147	142	370	------	180	13	50	500	------	260	25	35	50	------	5	0	5
29	32,662	21	55	------	8	147	142	450	------	200	8	12	250	------	100	5	9	50	------	5	0	0
30	31,585	21	60	------	9	144	141	460	------	280	11	26	480	------	165	8	25	100	------	55	0	0
31	31,933	22	60	------	8	140	137	350	------	60	20	55	300	------	80	16	15	10	------	100	0	0
Mean	34,300	23	55	------	15	142	132	350	------	140	70	56	290	------	105	21	32	199	------	60	1.9	1.8
Sept., 1923																						
1	29,050	23	60	------	8	137	137	450	------	100	15	15	250	------	110	19	80	1,000	------	100	0	0
2	27,910	23	60	------	8	136	136	300	------	200	50	40	250	------	120	30	20	100	------	10	0	0
3	27,276	23	60	------	8	136	137	400	------	200	60	100	170	------	80	12	40	100	------	0	0	0
4	31,394	24	70	------	9	137	136	300	------	85	45	82	330	------	100	41	55	50	------	5	5	0
5	33,454	24	60	------	10	137	139	610	------	360	160	170	850	------	260	70	80	100	------	10	0	0
6	32,725	24	60	------	10	139	137	380	------	150	130	80	280	------	150	70	60	100	------	55	0	5
7	32,472	23	70	------	14	143	141	450	------	150	200	160	360	------	100	80	80	100	------	10	0	0
8	31,268	22	70	------	14	144	140	800	------	120	50	140	750	------	120	90	75	100	------	100	0	0
9	27,466	22	80	------	15	143	124	300	------	160	90	140	500	------	170	100	150	1,000	------	100	10	10
10	33,105	21	80	------	15	140	114	775	------	160	80	80	375	------	115	41	43	1,000	------	100	5	5
11	33,549	20	75	------	15	136	118	700	------	200	60	50	430	------	75	35	45	100	------	55	5	10

12	32,060	19	70	------	15	148	120	700	------	260	60	67	1,000	------	320	43	55	100	------	55	10	5
13	29,747	19	75	------	15	148	124	370	------	175	35	55	530	------	500	70	45	1,000	------	55	10	0
14	29,684	18	80	------	15	150	126	800	------	200	30	20	500	------	250	45	20	1,000	------	100	100	10
15	27,941	18	70	------	15	150	138	1,000	------	170	50	60	500	------	450	20	10	100	------	100	10	0
16	23,633	18	70	------	15	152	131	500	------	140	30	140	400	------	80	21	70	100	------	10	0	0
17	34,087	18	70	------	15	152	128	2,800	------	300	120	40	860	------	300	100	40	100	------	10	10	10
18	31,711	17	80	------	17	158	138	930	------	360	40	60	270	------	120	21	17	50	------	50	0	10
19	31,996	17	80	------	15	155	135	600	------	220	24	60	170	------	160	7	24	1,000	------	1,000	0	10
20	29,240	18	80	------	17	152	138	175	------	75	35	40	260	------	55	14	20	50	------	5	0	10
21	31,173	18	80	------	18	156	150	180	------	90	30	30	130	------	80	10	15	100	------	100	0	0
22	28,100	18	80	------	17	152	147	1,500	------	320	60	70	140	------	75	15	12	100	------	10	0	0
23	26,547	18	75	------	17	154	141	950	------	240	40	90	340	------	60	18	30	100	------	100	10	0
24	30,983	19	80	------	17	160	148	1,550	------	500	30	46	430	------	145	12	24	550	------	550	0	0
25	34,119	19	80	------	16	171	152	1,300	------	410	140	50	450	------	150	31	24	1,000	------	1,000	10	5
26	31,141	20	80	------	18	172	147	1,200	------	300	70	25	260	------	90	12	9	550	------	55	5	0
27	30,222	20	80	------	18	165	133	700	------	180	30	20	140	------	70	11	6	550	------	505	10	5
28	32,345	21	80	------	18	164	141	500	------	200	35	27	190	------	100	5	14	1,000	------	10	0	10
29	28,575	21	80	------	18	161	136	280	------	90	70	50	320	------	200	15	25	100	------	100	10	10
30	26,769	21	80	------	20	150	136	1,400	------	60	40	25	400	------	100	5	15	100	------	0	0	0
Mean	30,325	20	75	------	15	150	136	760	------	210	65	70	390	------	155	35	40	347	------	145	7	3.5
Oct., 1923																						
1	31,458	19	75	------	18	157	137	700	------	100	65	65	240	------	100	26	19	500	------	55	5	5
2	35,323	19	80	------	18	155	62	600	------	70	39	45	290	------	160	26	27	100	------	100	5	0
3	32,662	18	70	------	13	156	137	370	------	55	50	85	120	------	50	17	40	100	------	10	0	0
4	32,824	17	70	------	15	156	133	300	------	130	35	70	100	------	65	20	31	50	------	55	5	2
5	31,901	16	70	------	15	160	133	900	------	110	55	50	400	------	60	14	5	1,000	------	100	0	4
6	28,036	15	70	------	16	155	147	450	------	120	60	30	400	------	50	15	5	100	------	100	10	0
7	24,647	15	60	------	15	160	143	450	------	50	15	20	300	------	120	12	10	100	------	100	0	6
8	30,951	14	50	------	17	158	142	250	------	80	22	17	130	------	40	9	8	100	------	5	5	0
9	33,232	14	50	------	16	160	141	280	------	100	21	20	235	------	20	6	9	100	------	10	0	0
10	31,996	14	50	------	15	161	148	150	------	65	5	8	185	------	55	6	7	550	------	550	0	8
11	28,131	14	50	------	16	161	142	400	------	80	12	20	140	------	30	3	10	100	------	1,000	0	4
12	30,000	14	50	------	15	160	142	1,150	------	130	25	21	180	------	40	12	5	100	------	100	0	4
13	29,304	15	50	------	16	156	140	800	------	40	25	12	260	------	20	7	9	100	------	100	0	2
14	25,375	15	50	------	16	158	140	220	------	80	11	8	400	------	250	10	30	10	------	0	0	4
15	29,082	14	50	------	14	156	145	285	------	90	20	32	300	------	70	10	9	100	------	10	0	0
16	31,363	14	50	------	15	154	137	780	------	130	23	16	400	------	65	10	9	100	------	55	0	0
17	30,856	15	57	------	11	155	143	425	------	40	14	9	50	------	50	4	9	50	------	10	5	0
18	30,254	15	60	------	14	158	140	320	------	90	21	33	135	------	35	5	6	50	------	5	0	8
19	29,018	14	80	------	7	155	150	550	------	60	20	5	140	------	20	7	5	50	------	10	5	4
20	28,670	13	80	------	9	156	148	700	------	800	70	30	250	------	40	10	10	10,000	------	100	0	8
21	23,569	13	70	------	8	155	150	15,000	------	5,000	100	5	4,000	------	600	70	8	10,000	------	1,000	100	4
22	28,353	11	75	------	8	152	148	5,200	------	800	210	8	700	------	190	65	6	5,050	------	100	55	10
23	31,078	10	70	------	9	154	147	2,100	------	600	130	5	525	------	80	9	2	100	------	100	10	6
24	29,240	10	50	------	10	158	148	3,800	------	425	85	3	375	------	11	13	3	1,000	------	505	10	0
25	28,923	10	50	------	8	155	146	450	------	90	26	3	90	------	16	21	2	5,000	------	55	10	8
26	29,145	10	50	------	10	156	146	250	------	30	3	3	100	------	20	1	4	100	------	100	10	2
27	28,321	9	50	------	10	157	147	370	------	150	21	16	350	------	30	5	2	1,000	------	100	0	2
28	26,611	9	50	------	9	161	148	300	------	20	14	3	120	------	18	3	5	100	------	10	10	6

Summary of daily laboratory results reported from each individual plant, located elsewhere than on the Ohio River, included in the survey of 1923–24—Continued

TOLEDO [illegible]IO) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Oct., 1923	*1,000 gallons*	° *C.*																				
29	29,018	9	50	------	9	162	151	1,350	---------	225	36	51	380	-------	60	5	3	500	-------	55	5	8
30	34,404	9	50	------	9	163	147	650	---------	190	50	75	130	-------	50	6	6	5,050	-------	10	0	4
31	30,191	9	50	------	8	164	147	230	---------	80	22	40	160	-------	19	3	4	5,500	-------	100	10	4
Mean	29,740	13	59	------	12	157	141	1,280	---------	320	42	26	375	-------	80	14	10	1,510	-------	150	8.4	3.7
Nov., 1923																						
1	28,575	8	50	------	8	165	147	260	---------	60	16	5	145	-------	45	8	3	550	-------	10	10	4
2	28,258	8	50	------	8	167	150	550	---------	280	10	50	70	-------	50	3	3	1,000	-------	100	10	4
3	26,611	7	50	------	8	169	153	700	---------	120	50	24	120	-------	20	9	1	100	-------	0	10	2
4	23,411	7	50	------	8	175	156	600	---------	70	60	22	140	-------	25	2	2	10	-------	100	10	6
5	26,516	8	55	------	8	197	164	500	---------	50	10	30	80	-------	16	3	2	50	-------	55	0	2
6	29,874	8	50	------	8	195	171	450	---------	40	20	36	100	-------	20	4	2	100	-------	10	0	2
7	27,815	8	50	------	8	185	163	675	---------	180	60	60	250	-------	16	4	4	1,000	-------	100	0	8
8	29,177	7	50	------	8	171	160	625	---------	115	45	40	125	-------	22	6	10	10	-------	10	5	6
9	29,557	6	50	------	8	180	156	500	---------	40	30	20	30	-------	14	2	1	100	-------	100	0	6
10	28,195	6	50	------	8	182	161	400	---------	30	8	2	120	-------	20	5	5	1,000	-------	100	0	8
11	24,868	6	50	------	8	180	164	240	---------	70	20	50	60	-------	20	2	4	10	-------	100	10	0
12	27,561	6	50	------	10	174	161	400	---------	35	30	4	80	-------	18	3	3	550	-------	55	5	4
13	31,046	7	40	------	9	175	160	350	---------	55	24	16	120	-------	9	3	5	500	-------	100	5	8
14	29,272	8	40	------	9	178	161	270	---------	170	24	16	110	-------	25	5	3	1,000	-------	55	10	4
15	27,878	7	50	------	9	180	161	240	---------	60	15	8	110	-------	18	5	3	100	-------	55	10	8
16	27,878	7	40	------	9	182	164	300	---------	110	7	4	50	-------	25	3	2	100	-------	100	10	4
17	27,878	7	40	------	9	183	169	520	---------	50	36	8	60	-------	15	4	2	100	-------	10	10	6
18	30,824	7	40	------	9	184	168	750	---------	400	60	26	400	-------	50	4	1	1,000	-------	1,000	0	6
19	29,050	6	40	------	9	185	165	400	---------	900	120	40	150	-------	100	40	8	1,000	-------	100	100	4
20	31,996	6	40	------	9	188	172	390	---------	220	35	31	105	-------	33	9	6	550	-------	55	5	10
21	27,846	6	35	------	9	194	179	3,100	---------	880	155	33	350	-------	125	33	10	50,000	-------	505	5	2
22	28,385	6	35	------	9	193	176	4,000	---------	1,000	180	90	250	-------	125	45	12	1,000	-------	1,000	0	8
23	27,702	6	35	------	9	197	176	400	---------	1,200	140	140	1,300	-------	700	90	60	100	-------	100	10	8
24	27,782	6	35	------	11	195	177	200	---------	220	100	30	70	-------	60	4	2	100	-------	100	10	6

25	27, 171	6	35	------	10	196	182	800	------	140	40	3	400	------	180	3	1	100	------	100	10	4
26	27, 720	6	35	------	10	196	176	1, 800	------	1, 400	50	90	800	------	500	90	60	100	------	10	5	2
27	31, 173	6	35	------	9	197	175	3, 500	------	250	50	65	600	------	500	40	40	100	------	100	0	8
28	27, 720	6	35	------	9	194	176	200	------	70	300	2	90	------	20	14	1	1, 000	------	10	10	0
29	28, 670	6	35	------	9	188	176	3, 000	------	350	40	20	200	------	800	6	2	10	------	100	10	4
30	25, 660	5	35	------	9	189	170	1, 500	------	200	35	35	80	------	40	6	7	1, 000	------	100	10	8
Mean	28, 202	7	43	------	9	184	166	920	------	290	60	33	220	------	120	15	9	2, 040	------	145	9. 3	5. 1
Dec. 1923																						
1	27, 815	4	35	------	9	186	170	600	------	160	40	80	80	------	50	5	3	1, 000	------	10	0	6
2	24, 900	4	35	------	9	188	168	200	------	100	8	20	60	------	40	4	2	1, 000	------	100	0	4
3	28, 163	4	35	------	9	183	166	500	------	105	27	45	70	------	25	3	6	1, 000	------	1, 000	55	10
4	31, 553	4	30	------	10	189	171	200	------	220	35	50	20	------	40	1	4	10, 000	------	100	10	2
5	29, 272	4	80	------	8	195	166	12, 000	------	800	300	160	100	------	30	2	5	10, 000	------	100	0	8
6	29, 525	4	390	------	9	183	175	28, 500	------	2, 500	400	150	2, 500	------	60	4	5	5, 050	------	505	10	8
7	27, 624	5	490	------	10	137	133	30, 000	------	3, 000	800	30	6, 000	------	120	10	2	10, 000	------	100	10	2
8	30, 222	5	400	------	12	104	119	40, 000	------	6, 000	2, 000	1, 200	7, 000	------	700	240	80	10, 000	------	100	10	10
9	25, 153	5	250	------	13	95	112	72, 000	------	4, 000	150	50	7, 000	------	80	40	5	10, 000	------	1, 000	10	4
10	29, 335	6	200	------	15	107	112	120, 000	------	18, 000	600	190	6, 000	------	135	21	25	5, 050	------	505	10	6
11	31, 553	5	170	------	14	114	117	27, 500	------	7, 500	800	300	1, 500	------	210	17	19	500	------	55	10	10
12	30, 286	4	130	------	19	122	122	11, 000	------	5, 000	700	180	2, 000	------	300	25	3	1, 000	------	1, 000	10	0
13	33, 390	4	160	------	9	129	123	23, 500	------	2, 800	700	160	1, 450	------	110	11	8	500	------	55	10	6
14	29, 208	4	600	------	17	130	129	700, 000	------	1, 400	600	140	15, 000	------	80	15	6	10, 000	------	100	10	4
15	26, 357	4	800	------	20	119	118	80, 000	------	7, 000	600	400	6, 000	------	300	18	34	10, 000	------	1, 000	100	10
16	26, 136	4	700	------	14	94	103	40, 000	------	4, 000	400	50	4, 000	------	100	20	30	10, 000	------	1, 000	100	10
17	28, 100	3	620	------	13	89	92	80, 000	------	2, 750	1, 100	600	5, 000	------	160	33	12	1, 000	------	550	55	10
18	32, 567	3	450	------	16	93	88	90, 000	------	11, 000	2, 500	700	3, 800	------	135	70	55	10, 000	------	1, 000	100	10
19	28, 068	3	325	------	10	100	92	47, 500	------	4, 500	1, 100	300	2, 000	------	85	19	10	1, 000	------	55	50	10
20	28, 258	3	260	------	9	113	98	50, 000	------	21, 000	600	105	2, 650	------	30	4	3	5, 500	------	55	5	8
21	29, 082	4	220	------	14	120	104	60, 000	------	5, 000	1, 400	2, 000	2, 000	------	150	20	17	10, 000	------	1, 000	10	10
22	27, 656	4	200	------	11	129	117	50, 000	------	4, 000	160	600	1, 900	------	60	6	8	10, 000	------	100	10	8
23	25, 850	4	300	------	8	135	121	65, 000	------	2, 800	80	250	3, 600	------	40	9	8	1, 000	------	10	0	8
24	26, 801	5	425	------	7	126	119	50, 000	------	3, 000	1, 000	500	2, 500	------	70	5	2	1, 000	------	10	10	10
25	25, 945	5	500	------	10	104	97	17, 500	------	2, 500	400	8	1, 500	------	600	14	2	10, 000	------	100	100	0
26	25, 597	5	400	------	8	96	85	31, 000	------	2, 500	900	310	2, 300	------	60	8	7	5, 050	------	55	50	10
27	28, 765	4	230	------	8	101	85	41, 000	------	2, 200	800	600	5, 000	------	50	19	37	5, 050	------	100	50	10
28	29, 779	4	290	------	8	108	92	40, 000	------	2, 200	700	19	3, 000	------	50	26	12	100	------	1, 000	10	10
29	30, 476	3	220	------	13	118	97	45, 000	------	6, 000	1, 200	800	2, 700	------	80	17	12	100	------	10	10	10
30	28, 385	3	200	------	11	120	102	32, 000	------	3, 000	1, 750	6	2, 000	------	20	2	0	10, 000	------	10	10	0
31	26, 484	3	210	------	13	125	110	36, 000	------	3, 000	130	1	2, 800	------	50	30	2	10, 000	------	10	0	2
Mean	28, 462	4	300	------	11	127	119	61, 970	------	3, 840	710	320	3, 280	------	130	23	13	5, 650	------	349	27	7
Jan. 1924																						
1	32, 060	2	150	------	15	130	113	3, 000	------	600	800	5	1, 200	------	80	160	3	100	------	10	10	2
2	29, 969	1	140	------	14	136	115	41, 500	------	6, 750	600	13	1, 100	------	85	16	3	100	------	100	10	0
3	32, 123	1	130	------	14	137	117	23, 000	------	2, 400	650	3	250	------	85	17	2	1, 000	------	55	55	0
4	35, 133	1	100	------	18	140	124	13, 000	------	7, 000	1, 000	0	900	------	100	35	0	1, 000	------	1, 000	100	4
5	34, 056	1	110	------	20	146	124	19, 000	------	4, 100	400	3	1, 500	------	190	100	1	1, 000	------	100	100	0
6	35, 354	1	100	------	20	158	139	60, 000	------	8, 000	1, 400	6	700	------	240	20	4	1, 000	------	1, 000	100	0

Summary of daily laboratory results reported from each individual plant, located elsewhere than on the Ohio River, included in the survey of 1923–24—Continued

TOLEDO (OHIO) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Jan., 1924	*1,000 gallons*	*° C.*																				
7	46, 189	1	80	......	20	164	145	32, 000	......	6, 000	2, 400	7	900	......	120	17	4	1, 000	......	1, 000	100	0
8	41, 057	1	80	......	9	173	151	3, 000	......	660	250	4	100	......	30	15	3	100	......	55	5	0
9	36, 558	1	50	......	8	171	148	5, 000	......	2, 200	105	1	4, 600	......	50	5	1	10	......	10	0	0
10	38, 332	1	40	......	8	172	144	6, 000	......	1, 000	200	4	250	......	25	2	2	550	......	10	5	0
11	33, 042	1	210	......	8	163	145	3, 000	......	250	200	2	100	......	10	3	3	10	......	10	0	2
12	37, 730	1	585	......	13	152	132	80, 000	......	12, 000	1, 400	20	500	......	180	35	1	1, 000	......	10	10	0
13	31, 584	1	650	......	10	111	100	100, 000	......	4, 000	6, 000	12	7, 500	......	150	30	4	100	......	10	10	2
14	38, 871	1	600	......	17	83	71	87, 500	......	16, 000	6, 000	30	4, 100	......	425	110	12	5, 500	......	550	55	2
15	36, 178	1	420	......	8	81	53	80, 000	......	5, 000	2, 200	4	2, 800	......	20	6	14	5, 500	......	5	10	10
16	37, 794	1	280	......	8	83	55	85, 000	......	2, 700	1, 600	1	2, 300	......	25	3	2	10, 000	......	5	10	2
17	39, 948	1	250	......	8	91	57	75, 000	......	1, 950	700	6	1, 900	......	20	2	2	10, 000	......	10	0	0
18	41, 627	1	220	......	8	103	69	40, 000	......	1, 600	600	1	1, 200	......	40	2	0	10, 000	......	0	10	0
19	31, 014	1	160	......	8	102	74	60, 000	......	10, 000	5, 000	4	1, 500	......	150	20	4	100	......	100	10	0
20	32, 788	1	140	......	9	104	78	40, 000	......	1, 400	350	3	3, 200	......	40	6	0	100	......	100	0	0
21	34, 657	1	130	......	10	107	84	19, 000	......	5, 000	1, 950	2	1, 700	......	130	35	2	550	......	100	10	0
22	43, 528	1	125	......	10	112	86	7, 000	......	2, 850	875	0	800	......	15	4	0	5, 050	......	10	5	0
23	35, 671	1	100	......	11	115	89	5, 500	......	1, 500	385	0	1, 350	......	65	1	2	1, 000	......	55	5	0
24	32, 377	1	90	......	9	114	92	10, 000	......	700	350	2	600	......	30	2	2	100	......	10	0	2
25	33, 982	1	90	......	9	113	94	20, 000	......	1, 200	140	4	500	......	70	4	17	1, 000	......	10	10	0
26	35, 861	1	90	......	9	115	90	10, 000	......	190	200	8	1, 000	......	30	2	8	100	......	0	0	2
27	36, 907	1	90	......	8	119	97	4, 000	......	50	40	5	300	......	10	1	2	100	......	10	10	0
28	34, 024	1	85	......	8	123	95	1, 500	......	160	50	1	550	......	30	6	0	10	......	5	10	0
29	32, 408	1	60	......	8	127	115	3, 200	......	350	80	5	100	......	55	3	0	550	......	55	0	2
30	33, 105	1	70	......	14	135	......	3, 600	......	375	100	0	500	......	45	3	0	500	......	5	5	0
31	32, 915	1	130	......	11	141	......	14, 500	......	2, 900	450	2	2, 700	......	30	6	3	1, 000	......	10	5	0
Mean	35, 705	1	180	......	11	126	103	30, 780	......	3, 510	1, 180	5	1, 510	......	85	22	3	1, 880	......	142	21	1
Feb., 1924																						
1	31, 553	1	300	......	14	128	127	55, 000	......	6, 000	4, 000	17	10, 500	......	20	5	2	1, 000	......	0	10	0
2	29, 304	1	450	......	10	93	91	60, 000	......	6, 500	2, 000	0	1, 400	......	100	0	5	100	......	100	10	2

3	27,466	1	260	------	12	76	76	70,000	------	6,000	3,000	2	3,500	------	120	40	3	10,000	------	1,000	10	2
4	31,426	1	250	------	18	75	87	65,000	------	8,500	3,000	3	4,200	------	375	80	3	5,500	------	550	100	2
5	33,359	1	180	------	19	82	81	17,500	------	2,900	1,550	2	2,800	------	120	21	20	1,000	------	100	100	0
6	33,802	1	150	------	17	94	89	33,000	------	5,500	2,100	3	1,000	------	70	13	5	500	------	50	55	0
7	32,852	1	150	------	12	102	99	27,000	------	4,000	600	2	600	------	60	12	2	100	------	55	10	0
8	33,707	1	150	------	12	105	95	35,000	------	3,000	200	2	800	------	30	2	4	100	------	10	10	4
9	31,204	1	130	------	12	106	97	16,000	------	3,000	700	0	800	------	40	10	4	1,000	------	100	10	0
10	27,403	1	120	------	12	103	90	1,200	------	150	200	5	800	------	100	6	10	1,000	------	100	100	0
11	31,521	1	100	------	12	104	95	8,000	------	1,300	300	0	200	------	20	5	6	100	------	10	0	0
12	33,390	1	100	------	11	106	97	5,000	------	600	170	2	800	------	50	7	4	1,000	------	10	10	0
13	31,616	1	100	------	11	107	94	3,150	------	410	165	4	180	------	45	5	7	100	------	10	0	0
14	31,711	1	100	------	13	111	99	6,450	------	170	120	4	400	------	80	11	5	100	------	10	5	0
15	30,761	1	100	------	14	117	106	1,500	------	140	60	3	200	------	30	4	2	100	------	10	10	6
16	34,182	1	90	------	10	119	101	2,000	------	90	60	0	300	------	50	2	1	10	------	100	10	0
17	28,765	1	80	------	11	126	108	1,600	------	70	40	0	200	------	20	2	0	10	------	10	0	0
18	32,155	1	80	------	11	130	114	1,800	------	105	40	2	400	------	20	3	3	500	------	55	5	0
19	36,558	1	60	------	14	134	133	600	------	260	90	2	100	------	100	8	2	100	------	100	100	2
20	33,359	1	60	------	12	142	135	3,000	------	300	40	2	2,500	------	80	4	3	100	------	10	10	2
21	32,915	1	70	------	18	148	144	3,000	------	400	60	20	1,500	------	50	10	4	10	------	100	10	0
22	34,947	1	60	------	12	153	147	2,500	------	300	40	4	560	------	50	4	5	100	------	10	0	0
23	32,630	1	50	------	15	158	153	7,000	------	600	140	2	1,000	------	50	40	8	1,000	------	10	10	0
24	28,860	1	50	------	15	163	153	2,500	------	260	80	6	200	------	50	2	2	1,000	------	10	0	0
25	35,861	1	40	------	15	172	162	650	------	180	50	2	1,500	------	60	40	4	100	------	55	55	2
26	36,558	1	35	------	16	179	172	800	------	260	50	3	100	------	40	6	2	100	------	50	55	0
27	35,481	1	35	------	15	180	175	1,000	------	190	45	26	250	------	25	5	2	100	------	55	5	4
28	32,408	1	30	------	14	184	176	700	------	260	30	1	200	------	30	3	2	550	------	10	5	0
29	31,996	1	30	------	14	179	172	800	------	300	20	50	300	------	40	2	3	1,000	------	0	10	4
Mean	32,267	1	120	------	13	127	119	14,900	------	1,780	650	6	1,290	------	65	12	4	910	------	93	25	1
March, 1924																						
1	31,236	1	30	------	14	171	166	4,400	------	1,000	500	2	200	------	30	23	3	100	------	100	0	0
2	28,068	1	50	------	12	170	167	4,500	------	2,000	300	2	200	------	50	3	2	1,000	------	100	0	0
3	32,155	1	175	------	18	172	164	53,500	------	7,000	2,900	300	1,750	------	80	23	4	100	------	55	55	6
4	32,567	1	240	------	24	133	121	65,000	------	22,000	10,000	2	700	------	45	16	5	100	------	500	10	4
5	32,218	1	425	------	32	89	73	55,500	------	16,000	18,000	3	1,600	------	60	65	6	550	------	550	10	0
6	30,919	1	1,700	------	30	92	81	82,500	------	42,500	15,200	7	5,400	------	500	21	8	5,500	------	100	55	2
7	32,662	1	1,000	------	25	85	57	340,000	------	28,000	6,000	10	4,000	------	200	16	14	10,000	------	1,000	10	2
8	32,947	1	770	------	39	81	65	25,000	------	35,000	10,000	7	8,000	------	1,500	40	10	100	------	100	100	4
9	27,973	1	600	------	35	83	68	50,000	------	50,000	12,000	60	3,000	------	90	20	18	100	------	100	100	10
10	31,141	1	350	------	40	87	81	13,000	------	7,650	8,000	12	1,450	------	200	100	30	550	------	55	55	4
11	34,721	1	300	------	35	89	82	21,500	------	11,250	3,900	12	1,850	------	185	65	20	5,050	------	10	10	4
12	32,313	1	300	------	45	94	84	44,500	------	4,050	2,600	10	1,950	------	140	55	40	1,000	------	505	55	2
13	32,915	1	380	------	34	104	83	9,000	------	4,000	1,050	6	3,100	------	155	37	30	100	------	10	5	4
14	31,553	1	290	------	23	112	90	7,000	------	1,300	340	3	400	------	50	14	26	10,000	------	10	10	0
15	31,426	1	360	------	23	114	89	45,000	------	1,800	350	15	700	------	20	5	15	1,000	------	0	0	0
16	27,561	1	300	------	18	108	85	18,000	------	700	500	3	1,400	------	70	16	7	1,000	------	10	0	2
17	31,078	1	300	------	21	104	87	10,500	------	4,250	1,700	4	1,050	------	40	20	10	550	------	55	55	2
18	33,834	2	250	------	22	107	85	25,000	------	4,000	700	6	700	------	60	12	5	1,000	------	100	10	2
19	32,915	2	190	------	21	112	85	12,500	------	1,050	505	5	500	------	80	48	7	550	------	50	55	0
20	31,458	1	240	------	18	119	99	14,000	------	700	70	3	1,400	------	60	2	4	1,000	------	10	10	4
21	31,648	1	170	------	18	124	97	30,000	------	2,600	1,000	2	800	------	40	2	1	100	------	10	0	0

Summary of daily laboratory results reported from each individual plant, located elsewhere than on the Ohio River, included in the survey of 1923–24—Continued

TOLEDO (OHIO) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
March, 1924	gall	*C.*																				
22	28,4[illegible]	1	150	------	17	129	103	9,000	------	400	30	2	1,200	------	30	8	2	1,000	------	10	0	0
23	27,751	1	150	------	19	137	115	2,600	------	100	50	1	700	------	40	5	2	100	------	10	10	0
24	31,299	2	200	------	19	150	130	8,500	------	1,400	240	2	250	------	35	4	2	100	------	55	0	0
25	32,838	3	310	------	17	132	115	12,750	------	2,200	510	1	800	------	55	18	3	100	------	55	50	0
26	31,680	4	280	------	20	120	98	16,500	------	3,600	1,700	3	2,750	------	80	12	4	550	------	100	55	0
27	30,729	4	420	------	24	95	77	6,750	------	3,500	1,400	2	1,100	------	65	15	5	1,000	------	55	10	0
28	28,860	4	410	------	31	93	83	50,000	------	8,000	2,100	5	4,000	------	150	23	8	100	------	100	100	0
29	30,064	4	360	------	31	92	85	22,000	------	10,000	1,700	18	1,000	------	80	25	23	1,000	------	100	100	2
30	26,009	4	1,750	------	50	83	72	96,000	------	22,000	3,500	20	5,000	------	180	52	15	1,000	------	100	100	2
31	30,412	3	1,800	------	50	70	38	65,000	------	17,500	6,500	40	9,500	------	250	120	25	1,000	------	100	5	0
Mean	31,013	2	460	------	27	111	94	39,340	------	10,180	3,670	18	2,140	------	150	28	11	1,460	------	133	33	1.8
April, 1924																						
1	26,527	4	1,520	------	20	74	54	50,000	------	12,750	7,950	28	12,000	------	450	55	30	5,000	------	100	55	0
2	36,273	4	1,020	------	22	77	62	44 000	------	4,800	4,500	28	6,000	------	300	40	19	500	------	100	10	0
3	31,331	4	820	------	26	84	75	65,000	------	2,250	780	41	5,000	------	195	28	12	500	------	10	5	0
4	30,571	4	700	------	16	92	77	15,000	------	800	400	35	2,000	------	80	30	20	1,000	------	10	10	2
5	27,941	5	600	------	20	97	83	40,000	------	8,000	1,500	10	2,600	------	150	50	5	1,000	------	100	100	2
6	26,484	6	500	------	20	105	84	12,000	------	1,100	600	25	4,500	------	300	60	8	100	------	10	100	2
7	28,797	7	320	------	18	117	97	5,800	------	3,000	400	17	2,000	------	55	10	11	100	------	55	5	0
8	33,802	7	250	------	21	123	94	2,500	------	400	240	20	700	------	55	16	11	50	------	55	55	6
9	30,983	8	180	------	21	138	118	4,250	------	400	125	29	600	------	100	13	6	100	------	55	10	0
10	30,888	8	150	------	20	144	121	2,750	------	250	40	37	300	------	15	3	4	100	------	10	0	0
11	32,345	8	150	------	19	149	139	1,800	------	180	40	20	200	------	14	4	2	1,000	------	100	0	0
12	29,620	9	130	------	17	156	147	1,400	------	400	70	70	230	------	17	4	3	10	------	10	0	0
13	25,153	10	120	------	15	160	146	700	------	60	12	20	150	------	5	2	2	100	------	10	0	0
14	30,191	12	110	------	18	162	152	1,200	------	240	35	47	250	------	30	2	2	10	------	5	0	0
15	32,788	11	100	------	17	167	149	700	------	120	150	120	400	------	10	6	2	10	------	10	0	0
16	30,032	10	100	------	17	166	145	250	------	220	50	90	300	------	40	5	3	10	------	5	0	0
17	30,476	10	90	------	17	170	150	550	------	50	30	120	195	------	30	2	3	50	------	10	5	0

18......	27, 529	11	100	......	17	166	150	800	....	220	70	100	200	....	20	4	2	100	....	10	0	0
19......	26, 452	11	90	......	20	163	148	1, 000	....	300	50	160	500	....	80	2	2	100	....	10	10	2
20......	22, 302	11	90	......	20	168	144	2, 000	....	180	40	200	360	....	30	2	2	100	....	10	10	4
21......	27, 371	10	80	......	20	172	153	1, 400	....	150	40	240	250	....	45	3	4	100	....	10	5	0
22......	32, 250	9	170	......	20	169	153	1, 900	....	1, 200	185	100	150	....	40	8	2	100	....	10	10	6
23......	31, 458	9	310	......	36	168	151	41, 000	....	6, 000	1, 700	500	300	....	85	12	5	5. 500	....	1, 000	100	4
24......	27, 529	9	520	......	40	130	126	38, 000	....	9, 000	1, 700	350	3, 000	....	175	60	13	10, 000	....	100	100	4
25......	30 222	9	420	......	35	116	96	6, 000	....	12, 000	1, 500	550	500	....	60	200	50	10, 000	....	1, 000	100	10
26......	25, 832	9	350	......	18	122	106	7, 000	....	300	700	500	200	....	160	60	19	1, 000	....	100	100	8
27......	28, 068	9	200	......	20	123	110	5, 000	....	1, 000	300	300	1, 800	....	50	8	6	1, 000	....	10	10	4
28......	31, 553	11	190	......	21	125	120	10, 000	....	600	85	200	550	....	80	5	7	100	....	55	5	2
29......	31, 489	12	200	......	20	128	110	3, 700	....	800	70	300	1, 000	....	80	12	13	100	....	10	5	0
30......	29, 082	12	150	......	20	133	112	2, 100	....	200	25	80	400	....	30	3	5	100	....	55	10	4
Mean	29, 846	9	325	......	21	135	119	12, 300	....	2, 230	780	145	1, 550	....	90	23	9	1, 260	....	101	27	2
May, 1924																						
1......	25, 905	12	130	......	16	140	120	1, 350	....	200	25	135	200	....	25	2	2	550	....	10	5	4
2......	30, 666	12	110	......	19	150	132	1, 000	....	200	30	15	200	....	9	2	4	10	....	10	0	0
3......	26, 421	13	100	......	15	151	137	2, 500	....	100	20	70	200	....	50	10	0	100	....	10	10	6
4......	25, 090	14	90	......	15	155	136	800	....	120	7	80	300	....	10	10	12	100	....	100	0	0
5......	31, 584	14	75	......	18	166	148	1, 200	....	70	4	34	90	....	40	4	1	50	....	5	5	2
6......	31, 996	14	85	......	20	167	144	450	....	160	16	2	145	....	25	5	3	550	....	100	10	4
7......	31, 458	14	75	......	18	171	154	1, 600	....	450	36	160	810	....	25	15	160	100	....	100	5	6
8......	30, 032	15	80	......	20	177	152	700	....	150	26	60	60	....	20	4	3	100	....	10	0	0
9......	27, 213	15	80	......	18	175	150	900	....	220	30	32	140	....	30	2	2	100	....	100	0	2
10......	27, 941	14	80	......	16	168	150	2, 000	....	140	10	24	120	....	20	3	3	100	....	100	0	0
11......	24, 932	16	150	......	17	163	149	1, 500	....	170	20	70	200	....	60	2	2	1, 000	....	10	0	2
12......	29, 810	15	210	......	30	142	141	4, 000	....	450	120	35	500	....	100	5	2	1, 000	....	100	55	6
13......	32, 357	15	180	......	24	148	150	4, 500	....	1, 000	35	65	350	....	30	5	5	100	....	505	10	2
14......	31, 204	15	190	......	53	141	143	2, 200	....	115	27	10	500	....	40	10	3	500	....	10	10	2
15......	33, 137	14	135	......	14	146	128	1, 000	....	800	35	31	200	....	60	7	10	5, 050	....	505	10	2
16......	32, 091	15	120	......	15	146	140	800	....	100	5	2	200	....	30	6	4	10, 000	....	10	0	0
17......	24, 425	16	160	......	20	138	134	600	....	130	12	6	240	....	80	8	3	1, 000	....	10	0	0
18......	27, 910	15	120	......	20	141	133	500	....	230	22	20	320	....	100	6	4	1, 000	....	10	10	4
19......	30, 666	15	120	......	20	149	140	850	....	135	23	7	300	....	35	8	4	5, 500	....	550	55	2
20......	31, 521	14	130	......	16	156	143	1, 250	....	150	23	20	170	....	40	6	6	100	....	100	10	4
21......	32, 757	14	130	......	19	158	146	800	....	160	17	7	50	....	50	7	3	5, 000	....	100	55	6
22......	28, 702	13	110	......	19	162	147	2, 900	....	75	14	6	50	....	33	5	4	100	....	100	5	0
23......	30, 507	13	110	......	17	166	148	500	....	160	14	9	60	....	30	3	10	1, 000	....	100	0	2
24......	26, 072	13	120	......	18	168	152	1, 200	....	120	12	8	240	....	30	5	3	100	....	10	0	0
25......	24, 108	12	130	......	18	168	151	3, 000	....	280	20	17	270	....	30	7	4	1, 000	....	100	10	4
26......	30, 412	12	100	......	18	171	150	750	....	130	24	2	55	....	40	7	5	550	....	55	5	2
27......	30, 666	14	90	......	18	183	156	1, 200	....	170	12	25	25	....	20	8	2	50	....	55	10	4
28......	28, 195	14	90	......	18	175	157	500	....	65	11	7	30	....	10	5	2	50	....	100	5	0
29......	31, 363	16	90	......	17	178	162	1, 000	....	90	30	3	20	....	30	4	1	10	....	10	0	0
30......	22, 841	14	90	......	18	178	165	500	....	250	45	2	50	....	30	6	4	10	....	100	10	2
31......	25, 217	14	90	......	17	185	167	850	....	400	45	24	220	....	35	25	5	100	....	10	10	4
Mean	29, 078	14	115	......	19	160	146	1, 380	....	225	25	30	200	....	38	7	9	1, 130	....	100	9. 8	2. 3

Summary of daily laboratory results reported from each individual plant, located elsewhere than on the Ohio River, included in the survey of 1923–24—Continued

TOLEDO (OHIO) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
June, 1924	*1,000 gallons*	° *C.*																				
1	22, 397	14	80	......	12	181	165	1, 200	....	150	40	4	250	....	20	35	5	1, 000	....	100	0	2
2	31, 268	15	80	......	8	174	167	700	....	150	70	7	170	....	26	30	8	10	....	100	10	0
3	34, 721	15	80	......	8	167	164	500	....	160	95	12	70	....	30	80	8	100	....	100	0	2
4	25, 090	15	80	......	11	167	164	520	....	165	130	14	140	....	22	105	10	550	....	100	10	4
5	27, 466	16	75	......	18	169	164	200	....	230	150	25	85	....	40	100	20	550	....	100	10	0
6	28, 543	20	75	......	18	167	162	180	....	170	140	30	120	....	50	100	24	100	....	10	0	4
7	27, 434	19	80	......	11	169	169	600	....	500	160	50	100	....	60	80	18	10	....	1, 000	0	2
8	23, 886	20	80	......	11	170	168	1, 600	....	180	90	6	160	....	70	150	25	10	....	10	10	2
9	28, 638	17	235	......	23	164	180	3, 350	....	550	150	30	750	....	95	80	25	1, 000	....	1, 000	5	8
10	26, 262	17	1, 015	......	19	114	130	8, 500	....	1, 200	170	33	1, 900	....	40	31	8	5, 500	....	550	5	8
11	27, 720	17	1, 000	......	6	100	106	2, 950	....	1, 200	155	65	2, 700	....	40	70	20	1, 000	....	550	10	6
12	28, 036	17	710	......	16	94	97	2, 000	....	70	4	2	1, 000	....	20	2	4	100	....	0	0	0
13	28, 321	19	510	......	31	98	101	3, 000	....	300	100	10	1, 000	....	30	3	2	1, 000	....	10	0	0
14	27, 624	19	380	......	18	105	104	12, 000	....	500	70	12	1, 000	....	50	10	5	100	....	10	10	0
15	25, 597	20	220	......	8	115	112	600	....	200	40	15	500	....	50	8	6	1, 000	....	10	10	2
16	25, 882	20	170	......	9	118	117	1, 300	....	170	50	33	150	....	50	22	10	100	....	55	0	4
17	29, 082	20	160	......	16	124	124	3, 350	....	190	30	11	220	....	85	9	4	50	....	55	10	0
18	27, 624	21	180	......	17	127	131	4, 750	....	750	60	60	325	....	75	13	5	5, 050	....	100	10	4
19	29, 969	22	150	......	20	138	143	1, 900	....	820	110	60	215	....	25	6	2	5, 050	....	550	10	0
20	28, 448	24	160	......	19	144	145	3, 700	....	1, 500	70	25	350	....	100	25	8	1, 000	....	1, 000	100	10
21	27, 561	24	170	......	16	153	151	700	....	1, 600	100	40	170	....	40	20	12	1, 000	....	1, 000	10	6
22	26, 136	24	200	......	15	151	144	900	....	460	40	90	700	....	230	25	18	100	....	100	0	10
23	30, 539	24	180	......	21	144	143	2, 100	....	600	50	95	675	....	335	36	35	5, 500	....	50	5	2
24	31, 870	25	120	......	18	155	149	1, 200	....	295	20	130	235	....	70	9	12	5, 050	....	1, 000	0	10
25	26, 579	24	125	......	16	169	164	1, 950	....	350	26	90	185	....	70	10	7	100	....	55	55	8
26	26, 832	23	200	......	23	148	153	4, 250	....	520	60	55	750	....	90	14	14	5, 050	....	550	0	6
27	28, 258	23	500	......	40	137	134	2, 300	....	2, 600	25	16	1, 000	....	400	8	16	100	....	100	10	10
28	26, 009	23	640	......	19	115	120	10, 000	....	650	30	40	1, 800	....	600	35	50	1, 000	....	100	0	8
29	24, 330	22	650	......	18	107	87	2, 000	....	500	22	60	1, 400	....	50	18	60	10	....	100	10	4
30	26, 516	21	490	......	21	116	93	11, 300	....	1, 300	180	40	775	....	190	23	11	1, 000	....	550	10	2
Mean	27, 621	20	290	......	17	140	138	2, 990	....	580	81	39	630	....	100	38	15	1, 400	....	300	10	4. 1

July, 1924																					
1	31,014	21	550	......	23	127	120	6,200	......	600	40	27	1,150	......	320	14	10	5,050	......	55	50	4
2	27,276	21	600	......	17	121	110	20,000	......	400	8	25	2,000	......	500	4	10	1,000	......	100	10	6
3	30,602	21	500	......	20	108	90	9,500	......	400	16	36	1,000	......	100	30	4	100	......	100	10	10
4	23,918	21	500	......	19	112	110	11,000	......	500	25	40	600	......	70	10	10	100	......	100	10	4
5	22,334	20	320	......	21	118	115	3,200	......	800	30	10	500	......	60	14	12	100	......	10	0	0
6	23,981	21	250	......	22	129	120	3,500	......	240	12	6	850	......	150	10	20	100	......	100	0	0
7	29,747	21	200	......	20	128	121	2,700	......	185	20	12	370	......	90	5	5	550	......	55	5	2
8	28,385	23	185	......	21	127	117	1,350	......	290	31	16	475	......	115	19	13	550	......	55	5	4
9	35,513	24	200	......	23	130	117	3,000	......	400	26	19	250	......	460	13	7	50	......	50	5	8
10	27,910	23	215	......	28	133	128	2,000	......	300	10	15	180	......	60	17	10	5,050	......	1,000	5	4
11	29,874	23	190	......	26	143	140	800	......	370	65	15	400	......	200	30	20	1,000	......	0	10	4
12	27,434	24	230	......	23	152	148	300	......	160	30	12	170	......	60	3	7	1,000	......	10	0	2
13	28,452	24	150	......	20	170	160	600	......	270	5	12	500	......	260	10	8	100	......	0	10	4
14	27,846	24	120	......	20	172	168	500	......	200	5	12	350	......	190	7	11	10	......	50	10	8
15	35,481	24	100	......	22	179	181	700	......	200	3	11	315	......	135	4	15	50	......	0	0	6
16	32,408	24	105	......	22	169	160	1,800	......	375	14	7	975	......	125	2	7	5,000	......	55	5	0
17	28,828	24	135	......	22	160	150	1,350	......	85	7	15	775	......	65	4	6	500	......	550	0	0
18	29,684	24	130	......	21	156	148	3,000	......	750	60	10	200	......	150	2	1	1,000	......	10	10	4
19	26,072	23	126	......	19	158	145	1,500	......	240	30	5	500	......	140	6	10	10	......	100	0	0
20	27,751	23	100	......	22	157	145	600	......	520	10	5	100	......	80	2	1	100	......	10	0	0
21	28,955	24	90	......	24	159	148	200	......	300	38	10	60	......	60	3	3	50	......	5	0	2
22	31,584	25	100	......	27	159	152	1,100	......	400	33	10	400	......	230	15	15	50	......	55	5	2
23	34,372	25	105	......	29	160	153	450	......	250	18	23	190	......	125	13	10	550	......	10	0	4
24	37,382	25	100	......	30	160	156	500	......	250	15	20	190	......	125	5	10	50	......	55	10	4
25	28,607	25	140	......	28	161	159	700	......	450	45	18	400	......	300	10	10	10	......	0	0	0
26	30,539	25	120	......	27	163	162	5,000	......	800	300	22	700	......	160	30	15	10	......	0	0	0
27	27,149	25	130	......	27	162	160	400	......	250	90	10	400	......	200	10	5	10	......	0	0	2
28	29,842	25	140	......	30	164	153	400	......	175	60	40	125	......	175	25	10	50	......	55	0	0
29	36,653	24	130	......	28	168	160	450	......	200	140	21	75	......	250	25	30	550	......	5	5	2
30	36,273	25	125	......	27	168	158	720	......	1,000	500	30	75	......	225	23	23	50	......	0	5	4
31	32,281	24	125	......	31	166	163	1,100	......	550	280	55	1,800	......	210	140	18	10	......	100	10	0
Mean	29,876	23	200	......	24	150	142	2,730	......	380	65	18	520	......	170	16	11	734	......	87	5.8	2.9

YOUNGSTOWN (OHIO) WATER FILTRATION PLANT

Oct., 1923		[3]										[4]					[4]				[4]
1	14,360	34	25	4	......	55	55	37,500	......	1	0	0	110,000	......	50	5	5	1,000	......	0	0	0
2	13,630	34	25	2	......	42	61	2,000	......	1	0	0	350,000	......	1	1	1	1,000	......	0	0	0
3	14,040	34	20	1	......	35	65	400	......	0	0	0	4,000	......	0	0	0	1,000	......	0	0	0
4	14,400	34	20	1	......	29	63	500	......	1	1	0	350,000	......	1	0	2	10,000	......	0	0	0
5	13,370	32	20	1	......	31	62	500	......	1	0	0	500,000	......	0	0	1	1,000	......	0	0	0
6	12,900	32	20	1	......	22	58	700	......	4	0	0	700,000	......	7	1	4	1,000	......	0	0	0
7	12,070	32	20	4	......	38	49	7,500	......	0	1	0	8,000	......	0	0	0	10,000	......	0	0	0
8	14,000	31	20	3	......	40	50	4,000	......	0	1	0	70,000	......	1	1	3	10,000	......	0	0	0
9	13,520	31	20	4	......	29	47	31,200	......	0	0	2	14,000	......	2	1	3	1,000	......	0	0	0
10	14,200	31	20	3	......	13	51	800	......	0	0	0	1,000	......	0	0	2	1,000	......	0	0	0
11	14,740	32	30	3	......	7	45	100	......	0	0	0	1,250	......	0	0	0	100	......	0	0	0

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[3] Filtered.

[4] Laboratory tap.

Summary of daily laboratory results reported from each individual plant, located elsewhere than on the Ohio River, included in the survey of 1923–24—Continued

YOUNGSTOWN (OHIO) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Oct., 1923	*1,000 gallons*	*° C.*																				
12	13,660	32	25	3	......	7	45	250	....	0	1	14	5,500	......	0	0	23	100	......	0	0	0
13	14,000	32	25	3	......	14	52	450	....	0	0	22	4,200	......	3	1	16	10,000	......	0	0	0
14	12,050	32	25	3	......	26	49	1,600	....	2	0	0	9,000	......	0	0	2	1,000	......	0	0	0
15	13,890	32	30	5	......	21	46	2,500	....	100	0	0	6,000	......	3	1	1	10,000	......	0	0	0
16	13,400	33	30	5	......	15	39	1,000	....	0	4	0	10,000	......	0	0	1	1,000	......	0	0	0
17	14,480	33	30	4	......	14	38	1,000	....	0	2	6	13,000	......	3	6	15	10,000	......	0	0	0
18	14,590	32	30	4	......	9	40	1,000	....	2	2	5	5,500	......	4	1	20	1,000	......	0	0	0
19	15,240	33	30	4	......	12	43	1,000	....	0	3	2	25,000	......	0	6	4	100	......	0	0	0
20	14,550	32	30	4	......	12	40	3,000	....	0	0	6	8,000	......	1	3	12	1,000	......	0	0	0
21	12,240	32	30	5	......	25	46	1,000	....	0	0	0	4,200	......	1	1	1	10,000	......	0	0	0
22	13,970	29	30	5	......	37	44	35,000	....	0	0	0	45,000	......	1	0	1	1,000	......	10	0	0
23	13,880	29	30	5	......	27	44	7,500	....	1	0	0	20,000	......	3	0	0	10,000	......	0	0	0
24	13,550	29	30	4	......	19	45	8,000	....	4	0	0	65,000	......	6	0	0	10,000	......	0	0	0
25	14,150	27	30	4	......	20	41	250	....	2	5	9	15,500	......	3	8	5	1,000	......	0	0	0
26	13,850	28	35	5	......	25	45	900	....	0	12	8	6,500	......	2	5	7	1,000	......	0	0	0
27	13,950	28	35	2	......	32	57	500	....	0	8	6	6,300	......	1	10	5	10,000	......	0	0	0
28	13,490	28	35	1	......	32	39	1,400	....	0	1	0	4,000	......	0	1	0	1,000	......	0	0	0
29	15,490	26	35	2	......	30	48	900	....	0	0	3	5,500	......	1	1	10	1,000	......	0	0	0
30	14,000	26	35	2	......	28	53	1,600	....	0	0	0	4,400	......	0	0	8	10,000	......	0	0	0
31	14,250	25	35	1	......	26	48	300	....	5	4	0	1,800	......	0	1	0	10,000	......	0	0	0
Mean	13,870	31	28	3	......	25	49	4,900	....	4	1	3	77,000	......	3	1	5	4,400	......	0.3	0	0
Nov., 1923		[3]										[4]					[4]					[4]
1	13,680	25	35	1	......	34	55	900	....	0	0	0	2,600	......	0	1	3	10,000	......	0	0	0
2	13,240	24	35	1	......	52	53	19,000	....	1	0	0	20,000	......	8	0	37	10,000	......	0	0	0
3	13,120	24	35	3	......	49	56	1,000	....	0	0	0	5,500	......	1	0	0	1,000	......	0	0	0
4	11,850	25	35	5	......	60	53	15,000	....	3	1	0	15,000	......	2	4	0	10,000	......	0	0	0
5	13,890	26	40	6	......	33	51	1,000	....	4	1	0	1,500	......	2	0	0	1,000	......	0	0	0
6	13,610	26	40	5	......	37	43	200	....	5	0	0	1,000	......	3	0	0	1,000	......	0	0	0
7	12,790	26	40	6	......	31	41	500	....	5	0	0	800	......	10	1	0	1,000	......	0	0	0
8	13,610	26	40	4	......	33	45	250	....	0	0	0	800	......	1	0	1	100	......	0	0	0
9	13,300	22	30	8	......	46	44	350	....	0	0	1	500	......	0	0	0	100	......	0	0	0

10	13,010	22	35	5	-------	44	37	800	-------	0	0	0	1,800	-------	0	1	1	1,000	-------	0	0	0
11	11,020	21	30	10	-------	44	39	300	-------	1	1	1	600	-------	5	1	0	1,000	-------	0	0	0
12	13,930	22	35	8	-------	32	39	250	-------	1	1	0	350	-------	0	6	3	1,000	-------	0	0	0
13	13,600	22	35	8	-------	29	41	100	-------	0	0	0	250	-------	0	0	1	1,000	-------	0	0	0
14	12,980	23	35	10	-------	45	47	400	-------	0	0	0	800	-------	0	0	0	1,000	-------	0	0	0
15	13,230	24	35	8	-------	55	45	600	-------	0	0	0	4,300	-------	1	1	6	1,000	-------	0	0	0
16	13,070	25	30	10	-------	67	43	100	-------	5	0	0	200	-------	5	0	0	1,000	-------	0	0	0
17	12,860	25	30	8	-------	76	48	3,200	-------	6	0	0	7,500	-------	3	0	0	10,000	-------	0	0	0
18	11,610	24	30	8	-------	76	40	12,000	-------	110	0	0	10,000	-------	90	0	0	10,000	-------	0	0	0
19	13,760	22	30	8	-------	64	42	25,000	-------	14	0	0	21,000	-------	6	1	1	1,000	-------	0	0	0
20	13,580	23	30	8	-------	40	43	12,500	-------	9	0	0	18,500	-------	7	0	0	1,000	-------	0	0	0
21	13,210	24	35	8	-------	26	35	200	-------	0	0	0	1,400	-------	0	0	0	1,000	-------	0	0	0
22	13,390	26	35	8	-------	26	36	600	-------	0	0	0	2,300	-------	1	0	0	1,000	-------	0	0	0
23	12,750	24	30	6	-------	48	57	500	-------	1	0	0	3,300	-------	0	0	0	1,000	-------	0	0	0
24	12,700	22	30	6	-------	71	44	4,000	-------	2	1	0	7,500	-------	2	0	0	10,000	-------	10	0	0
25	11,550	22	30	6	-------	78	38	12,500	-------	160	2	0	63,000	-------	190	0	2	10,000	-------	10	0	0
26	13,390	21	30	8	-------	50	41	1,200	-------	3	0	0	1,500	-------	3	1	2	1,000	-------	10	0	0
27	13,490	20	30	6	-------	35	42	450	-------	0	0	1	500	-------	4	1	1	1,000	-------	0	0	0
28	14,910	17	35	10	-------	55	61	250	-------	10	0	0	1,100	-------	60	0	1	100	-------	10	0	0
29	14,552	17	30	5	-------	73	47	3,500	-------	55	0	0	1,300	-------	0	2	0	1,000	-------	0	0	0
30	14,670	18	75	6	-------	83	44	13,000	-------	8	0	0	4,700	-------	6	0	1	1,000	-------	100	0	0
Mean	13,210	20	35	7	-------	50	45	4,300	-------	13	0.2	0.1	6,700	-------	13	1	2	3,010	-------	5	0	0
Dec., 1925		(3)										(4)					(4)					(4)
1	15,420	18	65	6	-------	71	46	1,500	-------	2	1	0	1,050	-------	2	0	0	1,000	-------	100	0	0
2	11,270	12	45	10	-------	60	54	6,800	-------	0	0	0	3,000	-------	5	1	0	10,000	-------	10	0	0
3	14,420	10	120	10	-------	45	62	17,500	-------	1	18	0	7,000	-------	0	21	1	10,000	-------	0	10	0
4	13,220	10	105	8	-------	40	51	50,000	-------	4	0	0	9,000	-------	10	2	0	10,000	-------	0	0	0
5	12,890	11	105	8	-------	48	54	80,000	-------	13	0	0	7,200	-------	12	1	1	10,000	-------	0	0	0
6	13,200	12	220	8	-------	57	40	7,500	-------	35	0	0	2,000	-------	50	1	0	1,000	-------	0	0	0
7	13,320	10	250	8	-------	32	62	25,000	-------	60	1	3	7,500	-------	45	0	2	10,000	-------	0	0	0
8	13,120	10	125	8	-------	27	85	25,000	-------	25	0	0	5,000	-------	50	1	0	10,000	-------	0	0	0
9	12,260	10	85	10	-------	30	74	17,500	-------	11	5	6	6,000	-------	20	2	10	10,000	-------	0	0	0
10	13,890	10	70	5	-------	31	64	21,000	-------	8	0	1	3,500	-------	10	1	1	1,000	-------	0	0	0
11	13,430	10	55	8	-------	31	91	11,000	-------	10	1	1	2,000	-------	40	1	2	10,000	-------	0	0	0
12	13,020	10	45	8	-------	30	66	9,000	-------	50	1	1	2,700	-------	30	4	3	1,000	-------	0	0	0
13	13,160	10	62	5	-------	36	59	20,000	-------	10	1	1	3,000	-------	27	1	0	10,000	-------	0	0	0
14	12,770	10	50	6	-------	42	64	23,000	-------	4	1	0	2,500	-------	5	1	1	10,000	-------	0	0	0
15	12,800	10	112	15	-------	48	57	14,000	-------	14	1	0	1,800	-------	32	1	2	10,000	-------	0	2	0
16	11,980	9	65	6	-------	40	61	17,500	-------	23	0	0	3,900	-------	28	0	0	10,000	-------	0	2	0
17	13,890	7	50	5	-------	37	52	18,000	-------	5	0	1	1,050	-------	9	1	0	10,000	-------	0	2	0
18	13,110	8	48	7	-------	46	56	16,500	-------	5	0	0	2,600	-------	2	1	1	10,000	-------	10	0	0
19	13,240	9	40	8	-------	46	55	29,000	-------	3	0	1	4,000	-------	11	1	1	10,000	-------	0	0	0
20	12,890	10	40	8	-------	46	55	26,000	-------	11	7	0	1,600	-------	3	0	0	10,000	-------	10	0	0
21	13,000	12	30	8	-------	44	49	35,000	-------	13	1	3	2,900	-------	3	0	0	10,000	-------	0	0	0
22	12,770	13	53	4	-------	47	53	18,000	-------	14	5	1	2,100	-------	7	0	0	10,000	-------	0	0	0
23	11,580	11	120	8	-------	34	70	34,500	-------	60	2	0	6,000	-------	18	0	0	10,000	-------	0	0	0
24	12,670	10	120	8	-------	33	64	7,500	-------	50	2	0	2,300	-------	19	0	0	1,000	-------	0	0	0
25	11,330	8	50	8	-------	34	70	3,000	-------	12	2	0	1,200	-------	11	0	0	1,000	-------	0	0	0

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[3] Filtered.

[4] Laboratory tap.

Summary of daily laboratory results reported from each individual plant, located elsewhere than on the Ohio River, included in the survey of 1923–24—Continued

YOUNGSTOWN (OHIO) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Dec., 1924	*1,000 gallons*	° *C.*																				
26	13,020	7	55	8	......	36	57	2,000	....	18	0	0	1,100	......	8	2	1	1,000	......	0	0	0
27	13,000	7	40	9	......	37	68	2,700	....	90	28	17	1,800	......	100	22	15	10,000	......	100	10	10
28	12,820	7	50	6	......	39	68	4,000	....	5	0	0	1,700	......	6	2	0	10,000	......	0	0	0
29	12,360	7	85	5	......	32	65	6,000	....	3	0	0	3,000	......	20	0	1	10,000	......	0	0	0
30	11,120	7	78	10	......	33	67	4,000	....	15	3	1	1,700	......	35	2	1	10,000	......	100	0	0
31	12,710	7	50	10	......	36	87	2,200	....	6	0	0	1,000	......	7	6	1	1,000	......	0	0	10
Mean	12,890	10	80	8	......	40	62	19,500	....	19	3	1	3,200	......	20	2	1	7,700	......	11	0.8	0.6
Jan., 1924		(3)										(4)					(4)					(4)
1	11,730	7	145	8	......	26	63	11,000	....	10	0	0	6,500	......	30	0	0	10,000	......	0	0	0
2	13,060	7	110	10	......	29	77	2,700	....	9	0	1	900	......	35	0	0	10,000	......	0	0	0
3	12,890	7	75	8	......	32	74	4,500	....	5	1	0	1,600	......	24	4	8	1,000	......	0	0	0
4	12,960	6	65	8	......	29	72	5,500	....	7	3	2	1,500	......	12	1	0	10,000	......	10	0	0
5	12,600	6	60	8	......	30	68	2,800	....	0	0	0	550	......	11	1	2	10,000	......	0	0	0
6	13,270	3	57	3	......	31	76	9,000	....	3	1	1	1,000	......	1	0	1	10,000	......	0	0	0
7	14,590	5	60	4	......	34	64	6,500	....	8	1	0	1,000	......	1	1	1	10,000	......	0	0	0
8	14,550	6	55	4	......	33	62	2,000	....	2	0	0	1,300	......	7	0	0	10,000	......	0	0	0
9	13,980	8	55	8	......	38	55	2,200	....	0	0	1	1,300	......	3	0	0	10,000	......	0	0	0
10	13,650	10	55	6	......	40	50	1,600	....	0	0	0	1,100	......	0	0	2	10,000	......	0	0	0
11	13,240	9	420	15	......	27	84	30,000	....	65	0	0	5,500	......	25	0	0	10,000	......	10	0	0
12	12,320	4	375	38	......	27	91	10,000	....	80	0	1	3,100	......	200	1	1	10,000	......	0	0	0
13	11,360	4	162	30	......	25	87	20,000	....	130	4	15	3,400	......	80	2	9	10,000	......	0	0	0
14	13,410	4	95	15	......	26	92	10,500	....	40	0	1	1,200	......	70	1	1	10,000	......	0	0	0
15	13,630	5	62	10	......	28	80	8,000	....	60	0	1	1,700	......	60	0	0	10,000	......	0	0	0
16	13,130	5	147	8	......	29	74	20,000	....	34	0	0	6,500	......	16	3	0	10,000	......	10	0	0
17	12,680	4	235	20	......	23	101	10,000	....	75	0	1	7,000	......	60	2	1	10,000	......	0	0	0
18	13,060	4	190	25	......	22	92	18,500	....	190	9	2	5,000	......	60	2	3	10,000	......	0	0	0
19	12,420	4	105	15	......	22	85	12,000	....	60	3	0	2,500	......	46	2	2	10,000	......	10	0	0
20	11,380	4	70	8	......	25	80	11,000	....	12	0	1	2,000	......	8	1	1	10,000	......	0	0	0
21	14,590	4	90	8	......	27	70	10,000	....	3	0	0	500	......	20	0	0	10,000	......	0	0	0

22	14, 960	4	75	8	------	29	65	6, 500	---------	1	0	0	1, 000	-------	1	0	1	10, 000	-------	0	0	0
23	14, 050	4	70	8	------	32	61	7, 000	---------	4	0	0	1, 000	-------	12	3	0	10, 000	-------	0	0	0
24	13, 570	5	60	8	------	32	48	5, 500	---------	1	0	0	1, 000	-------	2	2	0	10, 000	-------	0	0	0
25	13, 870	10	45	4	------	32	63	3, 700	---------	0	0	0	500	-------	2	0	2	10, 000	-------	0	0	0
26	13, 840	10	35	5	------	28	52	1, 800	---------	0	0	0	600	-------	0	0	0	1, 000	-------	0	0	0
27	13, 050	9	35	4	------	33	48	3, 500	---------	1	0	0	1, 100	-------	0	0	4	1, 000	-------	0	0	0
28	14, 630	9	35	8	------	29	51	1, 200	---------	0	0	1	300	-------	0	0	0	1, 000	-------	0	0	0
29	13, 730	14	35	8	------	31	43	1, 900	---------	0	0	0	500	-------	1	0	0	1, 000	-------	0	0	0
30	13, 040	10	35	10	------	44	42	1, 000	---------	0	0	0	200	-------	1	0	0	1, 000	-------	0	0	0
31	12, 680	8	35	10	------	49	53	4, 500	---------	0	0	0	1, 500	-------	2	1	3	10, 000	-------	0	0	0
Mean	13, 260	6	101	11	------	30	68	7, 700	---------	25	1	1	2, 000	-------	26	1	1	8, 260	-------	1. 3	0	0
Feb., 1924		(3)										(4)					(4)					(4)
1	12, 560	8	70	15	------	39	55	6, 200	---------	11	1	2	800	-------	15	1	3	1, 000	-------	10	0	0
2	12, 790	6	75	8	------	29	60	9, 000	---------	0	0	0	1, 500	-------	14	0	1	1, 000	-------	10	0	0
3	11, 650	7	55	10	------	28	58	5, 500	---------	7	0	0	600	-------	3	0	1	1, 000	-------	10	0	0
4	13, 350	8	60	10	------	29	49	4. 000	---------	4	0	0	700	-------	3	0	0	10, 000	-------	10	0	0
5	12, 210	9	80	8	------	51	49	11, 000	---------	6	0	1	500	-------	1	0	1	10, 000	-------	10	0	0
6	13, 020	6	190	10	------	31	56	19, 000	---------	55	0	0	1, 700	-------	17	1	0	10, 000	-------	0	0	0
7	13, 130	4	150	25	------	28	84	11, 000	---------	400	10	36	2, 000	-------	50	0	1	1, 000	-------	10	0	0
8	13, 280	4	80	8	------	24	82	13, 000	---------	85	11	0	600	-------	32	1	1	10, 000	-------	0	0	0
9	12, 630	4	60	8	------	26	66	9, 000	---------	8	0	0	500	-------	5	2	0	1, 000	-------	100	0	0
10	11, 850	5	50	6	------	27	56	2, 800	---------	2	0	0	400	-------	2	0	1	10, 000	-------	0	0	0
11	13, 720	7	40	8	------	29	55	4, 000	---------	1	0	0	300	-------	4	0	0	10, 000	-------	10	0	0
12	12, 780	8	40	8	------	34	47	4, 000	---------	0	0	0	1, 400	-------	1	0	1	10, 000	-------	10	0	0
13	12, 960	10	40	6	------	32	44	3, 000	---------	6	0	0	900	-------	0	0	1	10, 000	-------	10	0	0
14	12, 490	11	35	8	------	31	40	1, 600	---------	0	0	1	200	-------	2	0	0	1, 000	-------	0	0	0
15	12, 420	12	35	6	------	33	41	550	---------	0	2	0	300	-------	0	0	0	1, 000	-------	0	0	0
16	12, 110	12	30	6	------	33	47	700	---------	1	1	0	50	-------	1	1	0	1, 000	-------	0	0	0
17	11, 180	12	30	8	------	34	44	1, 000	---------	3	0	0	50	-------	0	0	0	1, 000	-------	0	0	0
18	12, 830	12	30	8	------	35	41	500	---------	0	0	0	50	-------	1	0	0	1, 000	-------	0	0	0
19	12, 490	12	30	8	------	36	41	1, 000	---------	0	1	1	200	-------	1	1	0	1, 000	-------	0	0	0
20	12, 300	12	40	8	------	41	51	3, 000	---------	3	0	0	350	-------	0	0	0	10, 000	-------	0	0	0
21	12, 800	11	40	8	------	39	43	600	---------	0	0	1	450	-------	1	0	0	1, 000	-------	0	0	0
22	12, 110	11	40	8	------	40	42	800	---------	0	0	0	100	-------	0	0	0	1, 000	-------	0	0	0
23	12, 120	10	35	6	------	39	40	2, 000	---------	1	0	0	100	-------	0	0	0	1, 000	-------	0	0	0
24	11, 480	10	35	8	------	42	41	250	---------	0	0	0	100	-------	0	0	0	1, 000	-------	10	0	0
25	13, 430	11	35	8	------	36	45	4, 500	---------	0	0	0	150	-------	0	0	0	1, 000	-------	0	0	0
26	12, 780	12	35	8	------	43	44	600	---------	1	0	0	150	-------	0	0	0	10, 000	-------	0	0	0
27	12, 400	13	35	10	------	50	41	600	---------	0	0	0	400	-------	1	1	0	1, 000	-------	10	0	0
28	12, 610	12	40	10	------	42	40	950	---------	0	1	0	100	-------	1	0	0	10, 000	-------	0	0	0
29	12, 680	11	35	10	------	46	42	425	---------	0	0	0	100	-------	0	2	0	1, 000	-------	10	0	0
Mean	12, 540	9	54	9	------	35	50	4, 100	---------	21	1	1	500	-------	7	0. 3	0. 3	4, 410	-------	7. 6	0	0

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[3] Filtered.

[4] Laboratory tap

Summary of daily laboratory results reported from each individual plant, located elsewhere than on the Ohio River, included in the survey of 1923–24—Continued

YOUNGSTOWN (OHIO) WATER FILTRATION PLANT—Continued

Day	**Volume** of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
Mar., 1924	*1,000 gallons*	° *C.*	(3)									(4)					(4)					(4)
1	12,470	10	40	8	------	45	46	900	----------	0	0	1	300	--------	0	2	0	1,000	--------	0	0	0
2	11,520	8	30	10	------	53	46	2,800	----------	1	0	0	500	--------	0	0	0	1,000	--------	10	0	0
3	13,300	8	42	12	------	60	46	2,500	----------	9	0	1	300	--------	2	0	0	1,000	--------	10	0	0
4	12,890	6	102	20	------	37	57	25,000	----------	230	1	4	2,000	--------	14	1	1	1,000	--------	10	0	0
5	13,220	5	180	20	------	24	80	35,000	----------	300	2	4	1,500	--------	70	0	0	10,000	--------	0	0	0
6	12,920	4	170	25	------	23	86	25,000	----------	400	4	14	1,700	--------	55	0	0	10,000	--------	0	0	0
7	13,070	4	75	15	------	21	86	15,000	----------	120	3	0	700	--------	18	1	4	1,000	--------	0	0	0
8	12,790	5	60	15	------	28	64	3,200	----------	8	1	1	200	--------	6	1	2	1,000	--------	10	0	0
9	11,500	5	50	15	------	29	54	6,300	----------	60	0	0	500	--------	26	0	0	1,000	--------	0	0	0
10	13,230	6	45	10	------	34	64	7,000	----------	0	0	0	700	--------	0	0	0	1,000	--------	0	0	0
11	12,560	6	45	10	------	36	48	6,700	----------	4	0	1	800	--------	13	0	0	10,000	--------	10	0	0
12	13,510	6	40	10	------	39	52	4,300	----------	2	0	0	250	--------	3	0	0	10,000	--------	10	0	0
13	12,510	7	40	10	------	40	49	1,300	----------	2	0	0	300	--------	2	0	0	10,000	--------	0	0	0
14	12,240	8	40	10	------	44	50	1,700	----------	1	1	0	200	--------	4	0	1	1,000	--------	0	0	0
15	12,800	8	40	10	------	36	54	3,200	----------	0	0	0	300	--------	3	0	0	1,000	--------	10	0	0
16	10,980	6	36	8	------	29	51	2,600	----------	0	0	0	350	--------	3	1	0	1,000	--------	0	0	0
17	12,950	8	35	8	------	28	54	2,200	----------	3	0	0	700	--------	0	0	0	10,000	--------	0	0	0
18	12,310	9	35	8	------	29	48	1,000	----------	3	0	0	100	--------	2	0	0	10,000	--------	0	0	0
19	12,120	11	35	10	------	35	33	2,400	----------	0	0	0	500	--------	2	0	0	10,000	--------	10	0	0
20	12,090	12	35	10	------	33	42	700	----------	0	0	0	300	--------	6	0	3	10,000	--------	0	0	0
21	11,560	13	35	8	------	27	42	350	----------	0	0	0	100	--------	1	0	0	1,000	--------	0	0	0
22	11,600	14	35	8	------	29	43	700	----------	0	0	0	350	--------	0	0	0	1,000	--------	0	0	0
23	10,530	12	40	15	------	55	44	600	----------	1	0	0	200	--------	1	0	0	1,000	--------	0	0	0
24	12,680	8	125	10	------	36	71	1,300	----------	1	0	0	450	--------	8	0	0	10,000	--------	0	0	0
25	12,080	8	85	15	------	33	65	28,000	----------	10	0	0	1,000	--------	20	1	0	10,000	--------	0	0	0
26	14,050	9	90	25	------	30	73	19,000	----------	28	0	0	800	--------	19	0	1	10,000	--------	0	0	0
27	13,280	9	140	20	------	27	89	13,000	----------	70	0	0	3,000	--------	15	0	0	1,000	--------	10	0	0
28	12,280	9	95	20	------	26	87	13,500	----------	5	1	0	700	--------	18	0	0	10,000	--------	0	0	0
29	12,530	10	280	20	------	30	82	23,000	----------	4	0	0	4,300	--------	3	0	0	10,000	--------	0	0	0
30	10,690	11	215	20	------	26	89	22,000	----------	120	0	1	2,000	--------	50	0	0	10,000	--------	10	0	0

31	12,300	10	185	25	......	26	56	6,500	......	60	0	2	500	......	60	2	2	10,000	......	0	0	0
Mean	12,405	8	80	14	......	34	61	9,000	......	45	0.4	0.6	850	......	14	0.3	0.5	5,650	......	3.2	0	0
April, 1924		(3)										(4)					(4)					(4)
1	12,310	9	100	20	......	29	89	5,000	......	13	0	4	700	......	16	4	0	10,000	......	10	0	0
2	12,310	8	60	15	......	32	100	5,000	......	4	0	0	400	......	2	0	0	10,000	......	0	0	0
3	11,920	9	65	15	......	32	80	1,600	......	3	0	0	700	......	4	0	0	10,000	......	0	0	0
4	11,900	10	57	15	......	33	61	500	......	1	0	0	500	......	0	0	0	10,000	......	10	0	0
5	11,880	11	47	15	......	31	59	2,300	......	7	0	0	600	......	15	0	0	10,000	......	0	0	0
6	10,510	14	50	15	......	30	44	3,200	......	0	0	0	400	......	1	0	0	1,000	......	0	0	0
7	12,430	14	31	10	......	36	41	700	......	0	0	0	500	......	0	1	0	1,000	......	0	0	0
8	11,310	14	40	10	......	35	56	2,500	......	1	0	0	800	......	3	0	0	10,000	......	0	0	0
9	11,540	14	40	10	......	40	55	2,800	......	5	0	0	750	......	10	0	0	10,000	......	10	0	0
10	12,370	12	50	20	......	37	57	3,500	......	20	0	0	500	......	11	0	0	10,000	......	0	0	0
11	12,150	13	50	15	......	38	55	5,000	......	5	2	0	500	......	10	0	0	10,000	......	0	0	0
12	12,380	14	45	15	......	32	53	3,000	......	5	0	0	500	......	5	2	1	10,000	......	0	0	0
13	10,510	15	35	15	......	30	50	1,200	......	7	0	0	400	......	10	0	0	1,000	......	100	0	0
14	13,380	15	34	15	......	34	50	6,000	......	3	0	0	400	......	3	0	0	10,000	......	0	0	0
15	12,180	17	35	12	......	40	49	1,800	......	4	0	0	1,100	......	4	0	0	1,000	......	0	0	0
16	13,740	18	35	12	......	42	44	5,000	......	4	1	0	2,000	......	6	1	0	10,000	......	0	0	0
17	13,990	19	35	12	......	37	50	900	......	1	0	0	600	......	2	4	0	1,000	......	0	0	0
18	11,710	17	157	10	......	47	45	48,000	......	14	1	5	6,000	......	2	1	0	10,000	......	0	0	0
19	12,400	14	112	30	......	30	76	25,000	......	120	3	5	2,800	......	36	1	0	10,000	......	0	0	0
20	11,080	12	70	20	......	30	99	8,000	......	15	4	3	1,000	......	30	0	1	10,000	......	0	0	0
21	12,710	12	58	20	......	32	85	5,500	......	25	14	2	500	......	20	5	2	10,000	......	0	2	0
22	12,840	13	40	20	......	36	68	7,000	......	10	0	0	1,300	......	11	0	0	10,000	......	0	0	0
23	12,080	14	40	15	......	38	67	6,000	......	8	1	1	500	......	7	0	0	1,000	......	0	0	0
24	11,590	14	35	12	......	38	60	5,000	......	5	0	1	700	......	1	0	0	1,000	......	0	0	0
25	11,220	14	40	12	......	35	57	11,000	......	9	1	1	1,300	......	5	0	0	10,000	......	0	0	0
26	11,200	14	40	12	......	31	53	1,000	......	1	0	0	400	......	4	0	0	10,000	......	0	0	0
27	10,080	15	40	12	......	30	57	1,200	......	3	0	1	400	......	0	0	0	10,000	......	0	0	0
28	12,840	16	40	15	......	35	50	2,000	......	7	0	8	1,900	......	4	1	4	10,000	......	0	0	0
29	11,580	18	35	12	......	39	43	2,500	......	1	0	2	800	......	4	0	0	10,000	......	0	0	0
30	11,390	20	40	15	......	48	40	3,000	......	14	5	0	2,000	......	5	0	2	1,000	......	0	0	0
Mean	11,980	14	52	15	......	35	60	6,000	......	11	1	1	1,000	......	8	0.7	0.3	7,600	......	4.3	0.1	0
May., 1924		(3)										(4)					(4)					(4)
1	11,280	20	40	12	......	56	48	5,000	......	1	2	5	800	......	12	1	4	10,000	......	0	0	0
2	10,880	20	35	10	......	56	56	3,200	......	3	0	12	700	......	6	1	10	10,000	......	10	0	0
3	11,810	20	35	12	......	48	42	2,800	......	30	4	4	800	......	8	1	3	1,000	......	100	0	0
4	9,640	15	68	15	......	51	47	9,000	......	8	0	0	1,600	......	4	0	0	10,000	......	10	0	0
5	12,380	15	105	30	......	39	70	12,500	......	30	0	10	1,600	......	19	4	9	10,000	......	0	0	0
6	12,000	16	90	20	......	46	53	18,000	......	25	0	1	1,700	......	24	0	0	1,000	......	0	0	0
7	12,350	18	50	15	......	45	62	11,000	......	9	1	0	3,000	......	13	0	1	10,000	......	0	0	0
8	11,920	19	40	15	......	45	47	9,000	......	90	42	50	2,700	......	30	30	25	10,000	......	100	0	0
9	11,770	20	40	20	......	49	48	8,000	......	35	9	8	2,500	......	20	1	1	10,000	......	0	0	0

[3] Filtered.

[4] Laboratory tap.

Summary of daily laboratory results reported from each individual plant, located elsewhere than on the Ohio River, included in the survey of 1923–24—Continued

YOUNGSTOWN (OHIO) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
May, 1924	*1,000 gallons*	° *C.*																				
10	11,580	19	40	15	------	48	44	5,000	----------	4	1	1	1,000	-------	3	2	0	10,000	-------	0	0	0
11	10,610	20	40	12	------	48	42	4,000	----------	9	1	0	800	-------	2	0	0	10,000	-------	0	0	0
12	12,200	18	72	15	------	52	52	11,000	----------	9	6	6	3,000	-------	14	0	1	10,000	-------	0	0	0
13	12,250	16	72	25	------	36	85	17,000	----------	55	1	2	4,800	-------	50	1	3	10,000	-------	100	0	0
14	12,600	15	52	20	------	38	97	13,000	----------	190	5	7	2,000	-------	34	3	5	10.000	-------	10	0	0
15	11,870	15	63	20	------	42	93	4,500	----------	24	8	2	1,700	-------	38	2	2	10.000	-------	0	0	0
16	11,870	15	93	25	------	38	87	2,400	----------	100	4	4	1,800	-------	65	7	4	10,000	-------	0	0	0
17	12,210	16	45	25	------	41	81	3,600	----------	42	2	7	600	-------	45	5	6	1,000	-------	0	0	0
18	10,510	17	88	15	------	43	64	3,000	----------	6	0	2	1,100	-------	3	1	3	1,000	-------	0	0	0
19	12,710	16	72	15	------	51	53	7,500	----------	1	0	0	600	-------	1	1	0	1,000	-------	0	0	0
20	11,790	16	50	12	------	49	67	8,000	----------	0	0	0	500	-------	4	1	0	10,000	-------	0	0	0
21	12,160	17	50	15	------	46	56	6,000	----------	4	0	0	1,300	-------	3	1	2	10,000	-------	0	0	0
22	12,170	17	40	15	------	47	56	2,600	----------	19	0	0	900	-------	9	0	0	10,000	-------	0	0	0
23	12,250	17	40	10	------	47	56	3,200	----------	3	0	0	700	-------	0	1	1	10,000	-------	0	0	0
24	11,600	18	35	10	------	48	49	2,600	----------	8	0	2	2,300	-------	22	2	0	10,000	-------	0	0	0
25	10,230	19	35	10	------	49	46	2,500	----------	11	0	0	1,000	-------	7	0	1	1,000	-------	0	0	0
26	12,470	19	35	8	------	56	48	3,000	----------	10	0	0	600	-------	3	0	0	10,000	-------	0	0	0
27	11,330	19	35	10	------	59	53	2,200	----------	0	1	0	800	-------	8	4	1	1,000	-------	0	0	0
28	12,040	19	35	10	------	61	43	3,400	----------	20	0	1	1,200	-------	20	0	1	1,000	-------	10	0	0
29	11,980	20	42	10	------	62	36	2,500	----------	12	0	0	1,200	-------	8	4	2	1,000	-------	0	0	0
30	10,640	19	38	12	------	54	37	4,100	----------	30	3	1	1,400	-------	22	0	2	1,000	-------	100	0	0
-----	11,480	19	38	8	------	51	44	2,000	----------	2	3	0	800	-------	2	2	2	10,000	-------	0	0	0
Mean	11,700	18	52	15	------	49	57	6,100	----------	25	3	4	1,500	-------	16	2	3	7,100	-------	14	0	0
June, 1924																						
1	10,080	19	35	8	------	57	54	3,300	----------	3	2	(4) 1	1,100	-------	9	1	(4) 1	10,000	-------	0	0	0
2	12,290	20	35	7	------	63	43	8,800	----------	8	1	1	1,800	-------	2	0	1	10,000	-------	0	0	0
3	12,200	22	35	10	------	75	37	3,400	----------	45	1	5	1,200	-------	6	0	0	10,000	-------	0	0	0
4	11,770	23	35	5	------	72	54	11,000	----------	22	0	5	6,200	-------	11	7	11	10,000	-------	0	0	0
5	11,450	23	35	10	------	68	58	4,000	----------	45	5	2	1,200	-------	7	1	1	10,000	-------	0	0	0

6	11,960	25	35	5	......	63	43	8,000	......	60	3	3	1,700	......	36	1	4	10,000	......	0	0	0
7	12,340	25	35	5	......	55	40	1,500	......	3	0	0	800	......	10	2	5	1,000	......	0	0	0
8	10,030	26	60	5	......	63	44	1,500	......	4	1	1	300	......	0	0	1	1,000	......	0	0	0
9	11,850	22	35	5	......	70	38	1,000	......	80	0	0	200	......	13	0	0	1,000	......	0	0	0
10	12,370	21	35	4	......	69	42	8,000	......	110	6	0	2,100	......	40	0	1	10,000	......	10	0	0
11	12,240	20	35	6	......	63	44	7,500	......	55	2	9	1,300	......	20	2	1	10,000	......	10	0	0
12	11,890	23	35	4	......	62	45	3,800	......	150	2	5	1,000	......	45	0	4	1,000	......	0	0	0
13	12,360	23	35	4	......	58	49	1,600	......	9	1	5	700	......	2	1	3	1,000	......	0	0	0
14	12,330	24	35	4	......	52	49	1,700	......	23	0	0	700	......	8	1	0	1,000	......	0	0	0
15	10,390	24	30	4	......	61	40	2,200	......	24	0	0	700	......	11	2	7	10,000	......	0	0	0
16	12,930	25	35	4	......	59	41	1,000	......	25	0	0	300	......	3	0	0	1,000	......	0	2	0
17	13,290	26	30	3	......	64	38	2,000	......	8	3	2	400	......	15	0	0	1,000	......	0	0	0
18	12,100	27	30	4	......	72	38	3,500	......	14	0	0	1,100	......	35	4	3	10,000	......	0	0	0
19	12,260	27	30	4	......	80	42	5,500	......	50	4	1	3,000	......	8	1	1	10,000	......	0	0	0
20	13,690	30	30	4	......	75	47	6,000	......	30	4	3	11,500	......	150	6	7	10,000	......	0	0	0
21	12,980	30	30	3	......	68	51	10,000	......	10	6	18	25,000	......	[5]2,000	[5]350	[5]300	10,000	......	0	0	0
22	10,520	28	30	3	......	66	45	7,000	......	8	0	2	11,000	......	10	1	1	10,000	......	0	0	0
23	13,460	30	30	2	......	73	46	8,100	......	4	1	6	10,000	......	8	3	3	10,000	......	0	0	0
24	14,460	30	30	3	......	73	48	7,100	......	3	2	1	9,800	......	[5]3,000	[5]400	[5]300	1,000	......	0	0	0
25	15,490	30	79	8	......	67	49	25,000	......	65	2	1	48,000	......	[5]600	3	20	10,000	......	10	0	0
26	13,640	28	38	5	......	64	51	18,000	......	[5]180	3	3	19,000	......	55	2	1	10,000	......	0	0	0
27	14,560	28	38	5	......	59	40	15,000	......	[5]100	9	14	20,000	......	[5]2,700	20	10	10,000	......	10	0	0
28	15,350	28	260	2	......	81	44	7,000	......	[5]100	[5]20	[5]40	7,000	......	[5]1,200	[5]80	[5]70	10,000	......	0	0	0
29	10,640	25	360	23	......	28	90	18,000	......	[5]34	[5]20	[5]140	30,000	......	[5]2,500	[5]50	[5]250	10,000	......	0	0	0
30	13,110	22	195	30	......	42	103	4,000	......	[5]38	8	8	2,000	......	30	12	4	10,000	......	0	0	0
Mean	12,470	25	60	6	......	64	48	6,600	......	43	4	9	7,300	......	400	32	33	7,300	......	1.3	0.1	0
July, 1924		(3)										(4)					(4)					(4)
1	13,060	22	180	15	......	42	80	2,000	......	5	0	0	1,300	......	5	1	3	10,000	......	0	0	0
2	12,800	22	140	18	......	42	73	6,600	......	3	0	2	4,000	......	10	0	1	10,000	......	0	2	0
3	13,300	23	72	13	......	44	86	4,000	......	1	0	4	1,900	......	2	0	0	10,000	......	0	0	0
4	11,050	22	150	13	......	45	69	7,000	......	4	0	0	2,000	......	1	0	1	1,000	......	0	0	0
5	11,840	22	55	10	......	53	73	5,000	......	12	4	3	3,000	......	14	0	1	10,000	......	0	0	0
6	10,130	23	45	10	......	54	70	7,000	......	4	0	0	1,200	......	2	0	0	10,000	......	0	0	0
7	12,060	23	95	12	......	64	76	7,500	......	20	1	1	5,000	......	7	0	2	10,000	......	0	0	0
8	12,670	24	55	12	......	62	58	11,000	......	35	0	0	3,500	......	6	1	1	10,000	......	0	0	0
9	12,170	24	105	10	......	48	77	2,500	......	6	0	0	2,200	......	6	0	0	10,000	......	0	0	0
10	12,180	23	60	12	......	47	78	6,500	......	15	6	3	2,400	......	12	2	4	10,000	......	0	0	0
11	12,760	25	45	10	......	49	68	3,500	......	7	3	0	1,200	......	6	1	0	10,000	......	0	0	0
12	12,800	27	40	12	......	47	67	7,000	......	10	1	1	1,400	......	13	3	0	10,000	......	0	0	0
13	10,830	27	35	12	......	52	59	55,000	......	80	6	6	50,000	......	130	8	5	10,000	......	0	0	0
14	13,390	27	35	10	......	49	51	3,400	......	21	1	1	2,500	......	3	1	3	10,000	......	10	0	0
15	13,570	28	35	10	......	63	48	5,500	......	15	0	2	5,000	......	35	2	1	10,000	......	100	0	0
16	13,000	28	35	10	......	66	60	12,000	......	50	1	0	27,500	......	2	0	0	10,000	......	0	0	0
17	12,270	29	35	10	......	68	52	11,000	......	8	0	1	4,500	......	8	2	1	10,000	......	0	0	0
18	12,620	29	30	5	......	66	55	12,000	......	40	2	3	30,000	......	30	1	2	10,000	......	10	0	0
19	13,180	29	30	8	......	60	53	38,000	......	90	1	6	50,000	......	60	2	1	10,000	......	0	0	0
20	10,840	29	25	5	......	56	55	37,500	......	40	0	0	30,000	......	7	0	0	10,000	......	0	0	0
21	14,210	29	30	10	......	53	52	14,000	......	1	0	1	28,000	......	6	0	0	10,000	......	0	0	0

[3] Filtered.

[4] Laboratory tap.

[5] Pin-point colonies.

Summary of daily laboratory results reported from each individual plant, located elsewhere than on the Ohio River, included in the survey of 1923–24—Continued

YOUNGSTOWN (OHIO) WATER FILTRATION PLANT—Continued

Day	Volume of water treated	Water temperature	Turbidity (p. p. m.)			Alkalinity (p. p. m.)		Bacterial count per cubic centimeter (agar, 48 hours, 20° C.)					Bacterial count per cubic centimeter (agar, 24 hours, 37° C.)					B. coli index per 100 c. c.				
			Raw	Primary settled	Applied to filters	Raw	Applied to filters	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated	Raw	Primary settled	Applied to filters	Filtered, unchlorinated	Filtered, chlorinated
July, 1924	*1,000 gallons*	° *C.*																				
22	12,470	30	50	10	------	46	48	140,000	---------	13	0	0	110,000	------	4	0	1	10,000	------	0	0	0
23	12,920	30	30	8	------	54	48	23,000	---------	0	30	1	35,000	------	2	70	2	10,000	------	0	0	0
24	13,070	30	30	8	------	56	43	18,000	---------	3	0	0	45,000	------	1	0	0	10,000	------	0	2	0
25	13,130	30	30	8	------	52	42	16,500	---------	6	3	3	12,500	------	0	0	0	10,000	------	0	0	0
26	13,470	30	30	8	------	50	62	9,000	---------	5	0	1	23,500	------	2	0	0	10,000	------	0	0	0
27	11,640	30	30	5	------	50	47	11,500	---------	40	1	0	Broken.	------	25	0	0	10,000	------	100	0	0
28	15,230	30	30	5	------	47	42	4,500	---------	17	0	4	6,500	------	90	0	0	10,000	------	0	0	0
29	14,950	30	25	5	------	36	52	30,000	---------	20	3	40	5,500	------	60	2	10	10,000	------	0	0	0
30	14,710	30	25	5	------	41	64	30,000	---------	0	0	0	5,500	------	0	0	0	10,000	------	0	0	0
31	13,320	30	25	5	------	42	65	9,000	---------	0	1	0	4,500	------	0	0	0	10,000	------	0	0	0
Mean	12,770	27	52	9	------	52	60	21,000	---------	19	2	3	16,500	------	18	3	1	9,710	------	7.1	0.6	0
August, 1924		(3)										(4)					(4)					(4)
1	13,920	30	25	5	------	56	53	12,000	---------	15	1	0	12,000	------	6	0	0	10,000	------	0	0	0
2	13,550	30	30	8	------	67	41	10,000	---------	150	0	0	19,000	------	250	1	2	10,000	------	0	0	0
3	11,900	29	25	6	------	66	44	18,000	---------	21	0	2	6,000	------	5	3	10	10,000	------	0	0	0
4	15,070	30	25	6	------	43	52	12,000	---------	5	5	1	5,500	------	1	0	1	10,000	------	0	0	0
5	13,840	34	25	3	------	34	82	22,000	---------	0	0	0	2,000	------	0	0	0	10,000	------	0	0	0
6	14,480	35	20	2	------	30	60	500	---------	0	0	0	300	------	0	1	1	1,000	------	0	0	0
7	12,830	35	20	2	------	37	46	4,000	---------	0	0	0	4,000	------	10	0	1	10,000	------	0	0	0
8	14,210	35	25	3	------	52	49	2,400	---------	65	0	1	1,400	------	240	4	3	10,000	------	0	0	0
9	12,740	35	30	5	------	58	52	4,500	---------	180	1	0	1,200	------	500	1	2	10,000	------	0	2	0
10	11,440	34	30	8	------	41	52	3,500	---------	8	0	0	15,000	------	2	0	1	10,000	------	0	0	0
11	12,880	31	25	4	------	39	47	700	---------	0	1	0	2,200	------	1	0	0	10,000	------	0	0	0
12	13,060	31	25	5	------	39	48	8,000	---------	110	0	3	10,000	------	28	0	2	10,000	------	0	0	0
13	12,720	31	25	4	------	46	51	500	---------	35	0	0	600	------	7	0	2	10,000	------	0	0	0
14	12,730	31	25	3	------	53	43	7,000	---------	16	5	1	11,000	------	10	0	1	10,000	------	0	0	0
15	12,900	31	25	6	------	55	44	18,000	---------	150	0	6	21,000	------	100	7	8	10,000	------	0	0	0
16	12,280	31	25	6	------	48	47	23,000	---------	15	1	2	45,000	------	12	0	2	10,000	------	0	0	0
17	11,110	30	25	6	------	30	49	1,300	---------	22	1	2	1,200	------	10	0	0	1,000	------	0	0	0
18	13,500	29	20	3	------	20	45	800	---------	7	0	0	400	------	3	0	0	1,000	------	0	0	0

19	13,070	30	20	2	------	21	47	500	---------	0	0	0	800	-------	0	0	0	10,000	-------	0	0	0
20	12,800	30	15	2	------	28	41	500	---------	1	0	0	1,800	-------	2	1	0	1,000	-------	0	0	0
21	13,150	30	15	2	------	43	39	17,000	---------	28	0	0	33,000	-------	60	0	1	1,000	-------	0	0	0
22	13,500	33	100	2	------	44	52	9,000	---------	9	1	[3] 0	10,000	-------	0	1	0	1,000	-------	0	0	0
23	12,950	32	35	8	------	31	59	3,000	---------	14	0	150	6,000	-------	16	0	1	10,000	-------	0	0	0
24	11,060	30	25	2	------	19	49	4,500	---------	0	0	100	2,000	-------	0	0	70	10,000	-------	0	0	0
25	13,650	31	15	2	------	23	43	800	---------	2	0	0	1,200	-------	1	0	1	10,000	-------	0	0	0
26	13,440	32	15	2	------	28	50	5,000	---------	2	3	6	4,500	-------	1	0	6	10,000	-------	0	0	0
27	13,030	33	15	2	------	43	52	500	---------	1	0	0	14,000	-------	3	0	0	10,000	-------	0	0	0
28	13,220	32	20	3	------	47	50	3,500	---------	3	0	0	5,000	-------	5	0	1	10,000	-------	0	0	0
29	12,920	32	20	2	------	63	43	300	---------	12	0	9	9,000	-------	50	0	1	10,000	-------	0	0	0
30	14,000	32	20	3	------	65	46	7,500	---------	45	1	0	20,000	-------	43	2	0	10,000	-------	0	0	0
31	11,810	32	20	4	------	48	49	11,000	---------	55	0	0	65,000	-------	40	0	1	10,000	-------	0	0	0
Mean	13,020	32	25	4	------	42	49	6,800	---------	31	1	10	10,500	-------	45	1	4	8,260	-------	0	0.1	0
Sept., 1924												(4)					(4)					(4)
1	12,080	31	30	3	------	24	50	30,000	---------	6	0	2	35,000	-------	18	0	0	10,000	-------	0	0	0
2	12,500	30	80	5	------	47	43	45,000	---------	55	2	3	35,000	-------	100	2	1	10,000	-------	10	2	0
3	13,790	25	77	10	------	47	69	4,000	---------	20	0	2	800	-------	13	2	6	10,000	-------	0	0	0
4	13,420	24	73	20	------	39	64	4,500	---------	200	1	5	1,200	-------	50	1	1	10,000	-------	100	0	0
5	13,490	24	65	20	------	40	55	20,000	---------	70	3	8	5,500	-------	20	2	1	10,000	-------	0	2	0
6	12,940	24	50	15	------	33	54	4,500	---------	3	0	0	2,800	-------	2	0	1	10,000	-------	0	0	0
7	11,490	24	35	12	------	38	58	3,100	---------	4	0	0	1,600	-------	1	2	0	10,000	-------	0	0	0
8	14,610	25	35	15	------	35	59	3,000	---------	25	0	0	3,000	-------	6	0	1	10,000	-------	0	0	0
9	14,300	26	55	12	------	35	61	18,000	---------	5	2	3	40,000	-------	4	5	2	10,000	-------	0	0	0
10	12,650	24	45	12	------	43	48	2,000	---------	1	1	2	6,000	-------	2	2	2	10,000	-------	0	0	0
11	12,520	24	60	12	------	52	65	14,000	---------	3	1	0	6,000	-------	4	1	2	10,000	-------	0	0	0
12	12,200	20	85	12	------	39	62	1,600	---------	1	0	1	2,800	-------	2	0	1	10,000	-------	0	0	0
13	12,000	20	50	15	------	35	63	4,500	---------	8	0	0	600	-------	1	0	1	10,000	-------	0	0	0
14	10,560	21	42	3	------	38	57	9,000	---------	0	0	0	8,000	-------	0	0	0	10,000	-------	0	0	0
15	13,180	21	40	8	------	44	69	1,600	---------	2	5	2	6,000	-------	10	1	5	10,000	-------	0	0	0
16	12,500	20	40	10	------	41	63	1,000	---------	1	1	1	1,500	-------	3	0	0	10,000	-------	0	0	0
17	13,080	20	35	10	------	40	78	3,000	---------	17	1	2	1,000	-------	20	2	5	10,000	-------	0	0	0
18	13,540	22	35	15	------	34	75	1,500	---------	0	0	1	200	-------	0	0	0	10,000	-------	0	0	0
19	15,880	24	35	10	------	29	71	1,800	---------	0	1	1	200	-------	1	0	0	10,000	-------	0	0	0
20	13,890	24	63	10	------	36	65	2,400	---------	8	1	2	600	-------	5	0	0	1,000	-------	0	0	0
21	10,830	25	35	10	------	34	58	6,000	---------	22	1	15	3,200	-------	5	0	1	10,000	-------	0	0	0
22	13,690	25	35	8	------	29	73	7,000	---------	2	0	1	900	-------	0	0	0	10,000	-------	0	0	0
23	12,820	25	30	6	------	39	48	3,000	---------	24	1	60	8,000	-------	3	2	1	10,000	-------	0	0	0
24	12,770	25	30	8	------	64	55	2,000	---------	0	2	5	1,700	-------	1	1	6	10,000	-------	0	0	0
25	12,900	25	30	8	------	70	56	4,000	---------	0	0	1	5,000	-------	5	2	0	10,000	-------	100	0	0
26	13,930	27	30	8	------	69	52	5,000	---------	0	1	2	5,000	-------	2	0	0	10,000	-------	0	0	0
27	14,700	27	30	8	------	65	51	3,000	---------	5	2	2	12,500	-------	1	0	0	10,000	-------	0	0	0
28	11,220	27	35	8	------	56	50	20,000	---------	45	0	1	18,000	-------	0	0	2	10,000	-------	0	0	0
29	12,440	24	60	8	------	59	37	10,000	---------	5	0	40	6,000	-------	16	2	17	10,000	-------	0	0	0
30	12,850	20	93	10	------	42	72	35,000	---------	80	90	200	5,000	-------	70	30	80	10,000	-------	0	0	0
Mean	12,960	24	48	10	------	43	59	9,000	---------	20	4	12	7,300	-------	12	2	5	9,700	-------	7	0.1	0

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[3] Filtered.

[4] Laboratory tap.

APPENDIX C

DESCRIPTIVE DATA RELATIVE TO THE 17 MUNICIPAL WATER-PURIFICATION PLANTS INCLUDED IN THE SURVEY OF 1923–24

TABLE NO. 1.—*General data*

Plant	Ownership	Source of raw water	Originally constructed	Extensions	Rated capacity (M. G. D.)
			Year	*Year*	
1. East Liverpool, Ohio	Municipal	Ohio River	1916	None	6.0
2. Steubenville, Ohio	do	do	1915	do	6.0
3. Huntington, W. Va	Private	do	1886	At intervals	9.0
4. Ashland, Ky	Municipal	do	1920	None	2.5
5. Ironton, Ohio	do	do	1919	do	4.0
6. Portsmouth, Ohio	do	do	1913	do	8.0
7. Cincinnati, Ohio	do	do	1907	do	112.0
8. Louisville, Ky	do	do	1870	1909	75.0
9. Evansville, Ind	do	do	1913	1924	18.0
10. Henderson, Ky	do	do	1916	None	3.9
11. Albany, N. Y	do	Hudson River	1899	1908–1923	40.0
12. Chester, Pa	Private	Delaware River	1917	None	12.5
13. Elmira, N. Y	Municipal	Chemung River and impounding reservoir	1896	1904	7.0
14. Hackensack, N. J	Private	Impounding reservoir	1904	1913–1924	42.0
15. Niagara Falls, N. Y	Municipal	Niagara River	1912	None	16.0
16. Toledo, Ohio	do	Cuyahoga River	1910	1913–1921	56.0
17. Youngstown, Ohio	do	Mahoning River	1904	1914	28.0

Plant	Daily output (M. G. D.)		Population		Stages of treatment [1]
	Average	Maximum	City	Connected	
1. East Liverpool, Ohio	3.7		23,000		C–S–F–D.
2. Steubenville, Ohio	4.7	6.0	32,000		S–C–S–F–D.
3. Huntington, W. Va	4.5	5.3	50,177	[2] 12,193	C–S–F–D.
4. Ashland, Ky	1.4	2.1	25,000	20,000	C–S–F–D.
5. Ironton, Ohio	1.9	2.6	15,000		C_1–S_1–C_2–S_2–F–D.
6. Portsmouth, Ohio	4.8	7.0	35,870		C_1–S_1–C_2–S_2–F–D.
7. Cincinnati, Ohio	50.0	76.0	406,312		S_1–C–S_2–F–D.
8. Louisville, Ky	36.0	47.6	257,671		S_1–C–S_2–F–D.
9. Evansville, Ind	8.0	18.0	100,000	90,000	C–S–F–D.
10. Henderson, Ky	2.0	3.1			C–S–F–D.
11. Albany, N. Y	20.2	22.5			
12. Chester, Pa	6.1	8.8	60,000	70,000	A–C–S–F–D.
13. Elmira, N. Y	4.5	10.0	47,883	50,000	C–F–D.
14. Hackensack, N. J	29.9			300,000	C–S–F–D.
15. Niagara Falls, N. Y	11.0	12.8	65,000	58,500	C–S–F–D.
16. Toledo, Ohio	30.1	40.6	269,160	395,160	C–S–F–D.
17. Youngstown, Ohio	12.8	17.5	150,000	175,000	C–S–F–D.

[1] Key to symbols: A=areation; C=coagulation; S=sedimentation; F=filtration; D=disinfection.
[2] Consumers.

Subscripts "1" and "2" refer to primary and secondary stages, respectively.

TABLE NO. 2.—*Data on primary settling basins at five Ohio River plants*

Plant	Shape of basin	Number of basins	Dimensions (each)			Total capacity (M. G.)	Nominal detention period				Method of operation
			Length	Width	Effective depth		Rated	Year 1923			
								Average	Maximum	Minimum	
			Ft.	*Ft.*	*Ft.*			*Days*	*Days*	*Days*	
1. Steubenville, Ohio	Square	1	220	220	18	6.0	1.0	1.2	2.0	1.0	Plain sedimentation.
2. Ironton, Ohio	Rectangular.	1	184	50	15	1.0	.25	.5	.8	.4	Coagulation and sedimentation.
3. Portsmouth, Ohio	do	1	300	81	13	2.1	.26	.4	1.0	.3	Do.
4. Cincinnati, Ohio	Irregular	2				300.0	2.6	6.0	6.8	4.0	Plain sedimentation.
5. Louisville, Ky	Square	2	700	700	22	110.0	1.5	3.1	4.0	2.3	Do.

TABLE No. 3.—*Coagulant feed systems*

Plant	Chemicals	Feed	Points of application	Measurement
East Liverpool, Ohio	Al, Fe, and L	Al=solution	Grit chamber, mixing chamber, and applied water.	Orifice.
Steubenville, Ohio	do	L=dry solution.	Inlet mixing chamber	Do.
Huntington, W. Va	Al and L	Al=solution L=dry		Orifice and weighing.
Ashland, Ky	do	Solution		Orifice and weirs.
Ironton, Ohio	do	do	Primary, secondary, and applied.	Orifice.
Portsmouth, Ohio	do	do	Primary and secondary	Do.
Cincinnati, Ohio	Fe and L	Dry	Between settling and coagulating basins.	Manual.
Louisville, Ky	Al	Solution Dry (feet)	Inlet, coagulating basin	Orifice.
Evansville, Ind	Al and L	Dry	do	Weighing.
Henderson, Ky	Al	Solution	do	Orifice.
Albany, N. Y	do	do Dry	Raw, after pumps	Do.
Chester, Pa	do	Solution	Raw, before pumps	Do.
Elmira, N. Y	do	do	Raw	Do.
Hackensack, N. J	do	do	Raw, entering coagulating basin.	
Niagara Falls, N. Y	do	do	Raw	Orifice weir and weighing.
Toledo, Ohio	Al, Fe, and L	Al=solution L=dry	A=raw L=inlet to coagulating basin.	Orifice.
Youngstown, Ohio	Al, L, and S	A=solution L and S=dry	A=raw L and S=inlet to basins	A=orifice. L and S=weighing.

Plant	Mixing chambers					Remarks
	Number	Dimension	Flow	Baffles	Detention	
East Liverpool, Ohio.	1	28 by 7 by 14 feet.	Horizontal	10-15 feet outside clear.	5 minutes	By-pass provided.
Steubenville, Ohio	1	Channel 190 by 4 feet by 3 inches.	do	23 inches outside clear-16 inches clear.	Velocity = 0.5 foot-seconds.	Do.
Huntington, W. Va	None.					
Ashland, Ky	None.					
Ironton, Ohio	1	30 by 30 by 15 feet.	Horizontal	9 inches outside clear.		Between primary and secondary basins.
Portsmouth, Ohio	None.					
Cincinnati, Ohio	None.					
Louisville, Ky	None.					
Evansville, Ind	None.					
Henderson, Ky	2	8 by 25 by 15 feet.	Horizontal	15	20 minutes	In parallel.
Albany, N. Y	None.					
Chester, Pa	None.					
Elmira, N. Y	None.					
Hackensack, N. J						
Niagara Falls, N.Y	None.					
Toledo, Ohio	None.					Manually proportioned feed.
Youngstown, Ohio	None.					Venturi proportioned feed.

TABLE NO. 4.—*Coagulation basins*

Plant	Kind	Number	Dimensions, feet (each)	Total capacity (M. G.)	Baffles	Velocity flow (feet per minute)
East Liverpool, Ohio	Rectangular	2	75 by 53 by 18	1.064	1 long	
Steubenville, Ohio	do	2	115 by 46 by 16	1.4	do	
Huntington, W. Va	do	1	94.5 by 85 by 16	.9	do	0.30
Ashland, Ky	do	2	90 by 52.2	.52		
Ironton, Ohio	do	1	184 by 50 by 15	1.0	1 long	
Portsmouth, Ohio	do	1	130 by 65 by 18	1.2	3 long	.33
Cincinnati, Ohio	do	3	Nos. 1 and 2=400 by 200 by 24. No. 3=400 by 80 by 24	22.0	None	
Louisville, Ky	do	2	No. 1=340 by 80 by 20.5. No. 2=340 by 160 by 20.5.	12.0	No. 1=1 long No. 2=3 long	4.1
Evansville, Ind	do	4	200 by 85 by 30	12.0		2.0
Henderson, Ky	do	2	87.5 by 29.5 by ?	.62	1 long (each)	.57
Albany, N. Y	do	1	600 by 383 by ?	14.0	None	.53
Chester, Pa	do	2	100 by 54 by 16	1.0	do	
Elmira, N. Y	No coagulation basins					
Hackensack, N. J	Irregular	1		11.0	None	
Niagara Falls, N. Y	Rectangular	2	124 by 55 by 21	2.0		2.0
Toledo, Ohio	do	3	No. 1 and 2=500 by 100 by 16. No. 3=500 by 120 by 16.25.	19.1	Long	
Youngstown, Ohio	do	2	200 by 150 by 20	8.0	1 transverse	

Plant	Operation	Fluctuations in level	Detention period		
			Rated[1]	Based on actual flow	
				Average	Minutes
			Hours	*Hours*	*Hours*
East Liverpool, Ohio	Parallel	6 inches	4.0	7.1	
Steubenville, Ohio	Series		5.6	7.3	5.5
Huntington, W. Va		24 inches	2.4	4.8	4.1
Ashland, Ky	Parallel	None			
Ironton, Ohio	In series with primary basin	36 inches	6.0	12.6	9.2
Portsmouth, Ohio	do	Primary=6 inches. Secondary=0	3.5	5.7	3.9
Cincinnati, Ohio	Nos. 1 and 2 in parallel. No. 3 in series with Nos. 1 and 2.	24 inches	4.3	10.5	6.9
Louisville, Ky	Series, high turbidity; parallel, high consumption.		3.8	8.0	6.0
Evansville, Ind	Series	12 inches	16.0	36.0	16.0
Henderson, Ky	Parallel	8 inches	3.8	7.4	4.8
Albany, N. Y		6 inches	8.4	16.6	15.0
Chester, Pa	Parallel		1.9	5.6	3.9
Elmira, N. Y					
Hackensack, N. J			6.3	8.8	6.0
Niagara Falls, N. Y	Series		3.0	4.4	3.8
Toledo, Ohio	Nos. 2 and 3=Parallel in series with No. 1		8.2	15.2	11.3
Youngstown, Ohio	Parallel	12 inches	6.9	15.0	11.0

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[1] Based on total rated filter output capacity.

TABLE No. 5.—*Rapid sand filters—General design and operation data*

Plant	Number of filter units	Dimensions			Sand			Gravel	
		Length	Width	Depth	Effective (size m. m.)	Uniformity coefficient	Depth in inches	Depth	Sizes
		Feet	*Feet*	*Feet*				*Inches*	*Inch*
East Liverpool, Ohio	6	19.0	8.5	8.25	0.40	1.65	30	11	-------
Steubenville, Ohio	6	22.0	16.0	7.1	.45	1.50	30	10	-------
Huntington, W. Va	14	[1] 4-24.3 [1] 10-15	15.6 ([2])	10.3 8.0	.40	1.50	30	18	-------
Ironton, Ohio	4	24.0	14.5	5.6	.44	1.51	30	10	¼-1
Portsmouth, Ohio	8	25.5	14.5	7.1	.44	1.52	24	14	⅛-2
Cincinnati, Ohio	28	50.0	28.0	10.0	.42	1.21	30	14	¼-1
Louisville, Ky	18	47.0	23.0	10.0	.47	1.30	28	14	1/16-1½
Evansville, Ind	16	23.0	16.0	-------	.45	-------	30	12	⅛-2
Henderson, Ky	6	17.0	13.3	7.0	-------	-------	-------	-------	-------
Albany, N. Y	16	54.0	20.0	10.0	.45	1.50	26	18	⅛-2
Chester, Pa	10	34.5	14.0	8.0	.55	-------	30	6	-------
Elmira, N. Y	21	[1] 13.5	([2])	15.0	.55	1.16	40	6	-------
Hackensack, N. J	14	46.7	25.8	-------	.46	1.61	30	13	⅛-1½
Niagara Falls, N. Y	16	25.0	14.5	4.5	.40	1.60	30	9	-------
Toledo, Ohio	56	22.5	16.0	8.6	.36	1.55	24	17	1/16-2½
Youngstown, Ohio	28	21.1	16.5 14.7	8.25	.76	1.28	30	12	¼-2

Plant	Under drain system	Loss of head gauges	Controllers	Working loss of head		Rate filtration (M. G. A. D.)			Periods of service		
				Minimum	Maximum	Average	Minimum	Maximum	Average	Minimum	Maximum
				Feet	*Feet*				*Hrs.*	*Hrs.*	*Hrs.*
East Liverpool, Ohio	Manifold Strainer	Indicating manometer	Simplex	1.5	8.0	----	105	120	43	8.0	104
Steubenville, Ohio	do	Indicating	Vivian	1.5	11.0	90	71	123	47	12.0	90
Huntington, W. Va	Strainer False bottom.	Indicating recording.	Manual	1.6	6.0	62	54	73	----	----	----
Ironton, Ohio	Wheeler	do	Simplex	2.0	5.0	----	----	----	----	----	----
Portsmouth, Ohio	Manifold Strainer	Indicating	do	1.8	7.5	100	88	125	28	24.0	33
Cincinnati, Ohio	Ridgeblock	do	Vivian	1.5	12.0	123	----	----	24	1.5	50
Louisville, Ky	Manifold Strainer	Indicating recording manifold.	Pittsburgh	1.5	9.0	130	80	160	25	1.0	50
Evansville, Ind	Perforated pipe.	do	Simplex	----	----	----	----	----	----	----	----
Albany, N. Y	Manifold Strainer	Indicating manifold.	Bal. piston	1.5	5.0	70	60	110	24	4.0	72
Chester, Pa	Wheeler	Indicating	Simplex	1.5	9.0	90	----	----	----	----	----
Elmira, N. Y	Manifold Strainer	do	None	----	7.5	----	----	----	18	----	----
Hackensack, N. J	Ridgeblock	do	----	----	----	150	125	175	8	6.0	12
Niagara Falls, N. Y	Manifold Strainer	do	Vivian	3.0	11.0	----	100	130	----	----	----
Toledo, Ohio	Perforated pipe.	do	Venturi	1.5	9.0	68	43	92	23	18.0	55
Youngstown, Ohio	Manifold Strainer	do	Simplex	2.0	8.0	98	94	100	39	19.0	61

[1] Diameter.

[2] Round.

Appendix D

MEMORANDA RELATIVE TO LABORATORY PROCEDURES FOLLOWED IN CONNECTION WITH THE COLLECTIVE SURVEY OF MUNICIPAL WATER PURIFICATION PLANTS IN 1923–24

List of memoranda

Memorandum No. 1.—Procedures to be followed in connection with a collaborative survey of water purification plants.
Memorandum No. 3.—Record of laboratory procedures.
Memorandum No. 4.—Calculation of the *B. coli* index from fermentation tube tests.
Memorandum No. 6.—Final revision of laboratory methods.

NOTE.—The memoranda are numbered according to their original serial order.

The four memoranda which are included in this appendix were issued to the various collaborating plant operators prior to and during the progress of the survey, for the purpose of securing more nearly uniform laboratory methods and thus obtaining more comparable results. In presenting these memoranda, the original serial numbers have been retained. Memorandum No. 2, which is omitted, was not concerned with laboratory procedures. In the remarks which follow, the purpose of each memorandum given will be briefly described.

Memorandum No. 1 was prepared immediately following a preliminary visit to each plant, during which personal conferences were held with each collaborating plant operator and the general procedures to be followed in coordinating laboratory methods were discussed. In the course of these conferences, it was found that numerous difficulties stood in the way of securing an exactly standardized system of laboratory methods to be followed at the several plants, owing to the fact that variations in standard procedure had become established as a custom in individual instances and any deviation from these established methods would influence the historical comparability of the plant records. For this reason, it was deemed advisable to allow a certain degree of latitude to each collaborator in adjusting his laboratory methods to the new series of observations, particularly in the rapidity with which a change from an old to a new detail of procedure was made. In some cases it was found advisable, for example, to check the results obtained by the new method against those secured by the old one before changing to the latter.

In order to have a detailed record of the laboratory procedures followed at the several plant laboratories prior to the collaborative arrangement, copies of Memorandum No. 3 were distributed to and filled out by the various collaborators. Meanwhile, the first series of reports of laboratory results submitted by them had indicated that a considerable variation existed in the methods followed in enumerating the *B. coli* index from the results of fermentation tube tests. For the purpose of standardizing this method, Memorandum No. 4 was distributed, outlining a uniform procedure to be followed in calculating the *B. coli* index. As a result of issuing this memorandum, many inconsistencies in *B. coli* enumerations were remedied.

Following the receipt of a complete series of replies to the questions given in Memorandum No. 3, these replies were tabulated and compared. On the basis of these tabulations, Memorandum No. 6 was prepared, setting forth a detailed final revision of the standard laboratory procedures first outlined in Memorandum No. 1. The methods described in Memorandum No. 6 then became standard for all of the collaborating laboratories and after an exchange of correspondence, were adopted without modification by the five Ohio River plant laboratories enumerated in Memorandum No. 5, at which the collaborative arrangements in force during the period of the 1923–24 observations have been continued to date. In any future collaborative laboratory surveys of a similar character which may be made, the methods outlined in Memorandum No. 6 will be made the basis for the standard procedure.

[United States Public Health Service. Stream pollution investigations. Water purification studies]

(Memorandum No. 1)

PROCEDURES TO BE FOLLOWED IN CONNECTION WITH A COLLABORATIVE SURVEY OF WATER-PURIFICATION PLANTS

JULY 30, 1923.

In discussing arrangements with the various plant operators who are collaborating with the United States Public Health Service in an observational study of plants under their charge, a verbal understanding has been reached in each case as to the general procedure to be followed in connection with the furnishing of laboratory and operation data. In order that this understanding may be clear in matters of detail and that the procedure followed at the various plants may be as uniform as practicable, this memorandum has been prepared for the guidance of each collaborating chemist.

Summarizing of data

The schedule of daily laboratory results and operation data to be summarized monthly and transmitted to the office of Stream Pollution Investigations, United States Public Health Service, Third and Kilgour Streets, Cincinnati, Ohio, is given in Forms Nos. 1 and 2, copies of which are herewith attached and a supply of which will be furnished each collaborating chemist.[1] These forms may be filled out with pen or typewriter, and in the latter case extra copies of the form will be supplied wherever it is desired to make carbon copies for retention and file.

Laboratory results

Referring to Form No. 1, for summarizing laboratory results, the following remarks will serve as a guide in properly filling out this summary:

1. *Temperature.*—Record daily temperatures of either raw or coagulated water, preferably the latter, which represents more nearly the average condition of the water during treatment. As far as practicable, make the temperature observation at the same hour every day.

2. *Turbidity.*—Record daily turbidity readings for raw, settled, and coagulated water. Where more than one reading is taken during a given day at a particular point, record the average reading, noting, by a small figure in the upper left-hand corner of the space, the number of samples averaged.

3. *Alkalinity.*—Record daily for raw and coagulated water. Where lime treatment is used, record the alkalinity of the lime-treated water in the blank column next to that headed "Coagulated." Where more than one observation is made daily, record the average result for the day, noting the number of samples averaged.

4. *Bacterial counts.*—Wherever practicable, make and record counts at both 20° and 37° C. Wherever the count at only one temperature is practicable, the 48-hour 20° count is preferable. In a few plants it has been customary to make the count on standard agar from plates incubated for 48 hours at 37° C., which is a variation of the usual practice. Wherever this procedure is followed the longer period of incubation should be noted at the head of the proper group of columns, and it would also be desirable in such cases either to count and record the results obtained from the same plates after 24 hours incubation at 37° C., or to run, as a check, additional sets of plates incubated for 48 hours at 20° C. Wherever standard agar rather than standard gelatin is used for the 20° count it should be noted on the form.

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[1] For plants in Ohio, the regular form supplied by the State department of health may be used.

As far as practicable, counts should be made daily on samples collected at each step of purification. Where more than one sample is collected daily at a particular point record the average result for the day on the form, and note either at the bottom or on the reverse side of the form the number of daily samples on which the average figure is based.

5. *B. coli results.*—Under "Raw," "Settled," and "Coagulated" record the result from each dilution as (+) or (−). If more than a single tube is run for a particular dilution, record the result as a fraction, with the number of tubes positive as the numerator and the total number of tubes tested as the denominator. Under "Filtered" and "Final," record the number of tubes negative and positive in the respective columns. Where 1-cubic centimeter portions of filtered and final effluent samples are tested for *B. coli* in addition to the 10-cubic centimeter portions, use one column for results from each dilution, recording the result in the form of a fraction, as described above.

Operation data

The daily operation data, to be summarized on Form No. 2, require little explanation, as the terms and units employed are familiar to plant operators generally. The following remarks are intended merely to clear up any minor points of doubt which may arise concerning the meaning of the various column headings:

1. *Total water treated.*—Record here the total volume of water treated each 24 hours, including that which is diverted for washing filters, making up solutions, and so forth.

2. *Filters.*—Record the number of filter units in service during each 24-hour day; also the total number of filter hours and the average length of run between washings for all filters washed on that day.

3. *Washing.*—Record the number of filters washed, the average time of wash-water application per wash (also of air if used), and the rate of wash-water application in inches per minute ("I/M").

4. *Chemicals used.*—Record the total amounts of chemicals used and their dosage in grains per gallon (or parts per million for chlorine).

5. *River stage.*—Record the river stage as indicated by the nearest gauge regularly maintained by the United States Weather Bureau, the city, or other agency.

Laboratory procedure

In general, the laboratory methods outlined in Standard Methods for the Examination of Water and Sewage, American Public Health Association, fifth edition, 1923,[2] will be regarded as standard procedure for the present, except for two slight but important modifications which it is understood have been recommended for inclusion in the next edition of Standard Methods, and which it seems desirable to follow as far as practicable in connection with this study.

One of these modifications consists of adjusting the final reaction of both standard agar and gelatin solid media to a pH value of 6.8–7.2 rather than 6.8–8.4 as recommended in Standard Methods. (Fifth edition, pp. 93–94.) Experience has shown that 6.8–8.4 pH range is too wide for consistent results; hence, it is particularly desirable in the present case that the reaction of solid media be adjusted to a pH within the more narrow range.

The other modification refers to the method of preparing lactose broth for *B. coli* tests wherever a particular plant laboratory is not so equipped that lactose broth prepared according to Standard Methods can be autoclaved and cooled with less than 30 minutes exposure of the broth to the heat. Where a longer period of exposure is necessary, inversion of the lactose in the broth is likely to be a rather serious source of error in the presumptive *B. coli* test, and the use of a modified procedure outlined in an appendix [3] to this memorandum is desired. This modified procedure, which obviates prolonged exposure of the lactose to high temperatures in contact with the broth, has been followed for several years by Public Health Service laboratories in connection with stream pollution investigations, and has been found to eliminate difficulties and inaccuracies resulting from inversion of lactose. Wherever the autoclave is supplied with live steam from a pressure steam line the prolonged preheating period usually experienced in getting up pressure in the autoclave is avoided, and in this case use of the modified method is unnecessary.

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[2] Copies of this edition can be purchased from the American Public Health Association, 370 Seventh Avenue, New York City, for 40 cents with paper binding and $1.25 with cloth binding.

[3] Prepared by C. T. Butterfield, in charge of the bacteriological laboratory at the stream pollution investigations station of the U. S. Public Health Service at Cincinnati and referee on bacteriological procedure for the joint committee on standard methods, American Public Health Association and American Chemical Society.

In order to clear up any points of doubt which may arise in regard to the interpretation of Standard Methods in so far as they apply to the present study, the following remarks have been set down for the general guidance of the various collaborating chemists. Additional points which may arise from time to time will be dealt with in separate memoranda or by correspondence. Wherever the term Standard Methods is used in these remarks it will be understood to refer to the 1923 fifth edition.

Turbidity

The turbidimetric method, as outlined on pages 6 and 7 of Standard Methods, should be used for turbidities within the reading limits of this apparatus (with the 75-centimeter tube, turbidities as low as 25 parts per million can be determined in this way). For low turbidities, the use of bottle standards is desired, employing dilutions of the standard silica suspension. In recording turbidities, the rules given on page 8 regarding significant figures should be followed.

Alkalinity

In general, it will be advisable to follow the same procedure for alkalinity determinations as has been followed in the past at each plant, though the indicator used should be stated. The alkalinity corresponding with that which is usually determined with methyl orange as an indicator should be recorded in the column headed "Alkalinity" in Form No. 1. Where the phenolphthalein alkalinity is also determined it should be recorded in the columns with blank heading to the right of the "Alkalinity" columns.

Wherever routine determinations of hydrogen ion concentration are made on the raw or coagulated waters it is especially desired that these results be reported. If the columns with blank heading (Form No. 1) are not used for another purpose they can be used for the pH results. If they are otherwise used a separate summary of the pH results should be prepared each month and attached to the summary on Form No. 1.

Bacterial counts

The procedure outlined in Standard Methods for making the 20° and 37° counts should be rigidly followed, with the exception previously noted as regards the reaction of the gelatin and agar media. It is also desired that particular attention be paid to the following points, which Standard Methods does not discuss fully.

In making dilutions of samples for plating the shortest time practicable should elapse between the making of the dilution and the final pouring of the plate, in order to minimize any errors in the count which may result from rapid progressive changes in the bacterial content of the diluted sample. Care should also be taken as to the character of the dilution water used. Ordinarily tap water is preferable to distilled water for this purpose, but tap water should not be used where it contains any appreciable amount of residual chlorine or excess of lime. In such cases it is far preferable to use either the unchlorinated filter effluent or, if this is not practicable, to employ sterilized raw or presettled water, straining it through cotton before sterilizing it. It is very important not to have any bactericidal substances in the water used for bacteriological dilution purposes.

Particular care should be taken to maintain the proper incubator temperature and to keep the incubator atmosphere saturated with moisture. In counting plates the rules for expression of results given on page 103 of Standard Methods should be rigidly followed. Wherever extremely small or pin-point colonies develop on a plate but are shown to be absent from the blank plate they should be included in the count, with a notation as to their occurrence. The directions given on page 99 of Standard Methods, in regard to the limiting numbers of colonies on a plate should be carefully observed and dilutions planned accordingly.

B. coli determination

Since the *B. coli* results obtained at each plant are probably the most important of the entire series, as far as their practical bearing on the principal objective of this study is concerned, it is especially desirable that every practicable effort be made to have them accurate and comparable for the various plants. For this reason, the most careful attention should be given to following a standardized procedure in connection with the *B. coli* determination.

Reference already has been made to a modification of the method of preparing lactose broth in cases where prolonged exposure of the material to heat in its sterilization can not be avoided. Where this condition prevails (and it usually is the case wherever the broth is sterilized in an Arnold sterilizer or in an ordinary autoclave with a small boiler underneath), it is desired that the modified procedure outlined by Mr. Butterfield in the appendix attached to this memorandum be followed as closely as practicable.

For samples of raw, settled, and coagulated waters the presumptive test for *B. coli* as defined and described on pages 100 and 101 of Standard Methods will be sufficient; that is, the formation of more than 10 per cent of gas in the fermentation tube during periods of incubation up to 48 hours may be taken as presumptive evidence of a positive result.

For samples of filtered water, both prior to and after disinfection, partial confirmation of all presumptive tubes giving any gas up to 48 hours' incubation should be made, carrying the test through the Endo (or eosin methylene blue) agar plate and the second lactose broth tubes. The procedure in this case should be carried through the completed test as described on pages 101 and 102 of Standard Methods, except that the demonstration as to spore formation need not be carried out ordinarily unless the presence of an aerobic, spore-forming, lactose-fermenting organism should be suspected.

For the presumptive test as applied to raw, settled, and coagulated waters, a sufficient number of dilutions should be made in each case to give a true measure of the *B. coli* index; that is, the number should be sufficient so that the highest dilution inoculated will give a negative test. Ordinarily not more than three dilutions will be necessary, and frequently not more than two. Where 24-hour plate counts are made their variation will often serve as a guide as to necessary changes in dilutions to take account of fluctuations in the *B. coli* content.

For the partially confirmed *B. coli* test as applied to the filtered and final effluent samples it is desired that five 10 cubic centimeter presumptive tubes of lactose broth be inoculated for each sample, in order to obtain results capable of interpretation according to the procedure prescribed in connection with the Treasury Department standard. All positive presumptive tubes should then be carried through the Endo (or eosin methylene blue) plate and second lactose broth tube, as noted above, for partial confirmation.

The use of Endo's medium or eosin methylene blue agar in connection with the confirmation of positive presumptive tests for effluent samples is optional, according to current practice at the various plant laboratories. Where Endo's medium is used it is desired that the procedure outlined by Mr. Butterfield in the appendix to this memorandum be carefully followed.

General remarks

In concluding this memorandum, it is desired to emphasize the need of standardizing, as far as practicable, the methods of obtaining and reporting results obtained at the various plants included in this survey. The procedures which have been outlined in this memorandum have been drawn up purposely with a certain degree of flexibility, having in mind the limitations of current practice at the different plants which are necessarily imposed upon the operators collaborating in this work. For this reason it must be left largely to each collaborating chemist to carry out as faithfully as circumstances will permit the intent of the procedures outlined.

It is particularly desired to note that informal reports as to results of any special observations bearing on the following points would be of much interest and importance in connection with this study:

1. Any unusual conditions of operation affecting the efficiency of purification, either temporarily or for longer periods.
2. The presence of any taste-producing substances (e. g., phenolic compounds) in the raw water at any time and their effects on the water consumer as evidenced by complaints or observations.
3. Any undue prevalence of water-borne infections (e. g., typhoid, paratyphoid, dysentery, cholera morbus, etc.) in the city at any time, particularly where coincident with an excessive pollutional load upon the plant.
4. The degree to which costs of purification are influenced by excessive raw water pollution, particularly as regards added amounts of coagulants required.

It will be noted that no provision has been made in Forms No. 1 or 2 for recording costs of purification. The reason for this omission is that there has been some doubt as to whether the methods of classifying costs of operation are sufficiently uniform at the various plants to permit their being summarized according to a set form. For the present, therefore, it is requested that the classified cost of plant operation be summarized each month on the reverse side of Form No. 2, classifying them according to the usual practice at each plant in making up its records, or to whatever system may be followed in reporting such figures to the State health department. It is especially desired to obtain monthly figures as to the total costs of operation and the costs of those elements which vary with treatment (e. g., coagulants, wash water, etc.). The costs may be given either as totals or as costs per million gallons treated, according to current practice at each particular plant. If it seems desirable to do so later, a standard summary form will be prepared for the purpose.

A supplementary memorandum will be prepared shortly and distributed to the various collaborating chemists, giving a comprehensive outline of the purpose and principal objectives of the present survey. This matter has already been discussed rather fully with each collaborating chemist, but it is thought that a fairly complete statement of the problem in the form of a memorandum will be of service and interest to everyone concerned.

PREPARATION OF LACTOSE BROTH FROM DOUBLE-STRENGTH BROTH

To make standard lactose broth from double-strength broth, proceed as follows:

(1) Place 10 grams of lactose C. P. in a 2-liter Erlenmeyer flask, adding 1,000 cubic centimeters of distilled water.

(2) Heat in the Arnold or autoclave in streaming steam for one and one-half hours after the temperature has reached 100° C. (A covered funnel with connection attached for tubing the broth should be in the Arnold during this sterilization period.)

(3) Fifteen minutes before the one and one-half hour sterilization period is up loosen the stopper of one of the 1,000 cubic centimeter bottles of double-strength broth and place it in the Arnold.

(4) Remove from the Arnold. Flame the necks of both containers and add the 1,000 cubic centimeters of double-strength broth to the 1,000 cubic centimeters of sugar solution. Mix thoroughly.

(5) With proper precautions to insure sterility, place the lactose broth in the funnel and tube.

(6) Placed the filled tubes in the Arnold and sterilize in streaming steam for 30 minutes after the temperature reaches 100° C.

PREPARATION OF ENDO'S MEDIUM PLATES FROM STOCK ENDO AGAR

The stock Endo agar from which the medium is prepared is a 3 per cent agar put up in 200 cubic centimeter amounts. The sulphite is anhydrous, requiring only one-half the amount specified in Standard Methods. In making plates proceed as follows:

(1) Melt a 200 cubic centimeter bottle of stock agar.

(2) While hot add the following ingredients in the order indicated:

(*a*) Ten cubic centimeters of a sterile 20 per cent solution of C. P. lactose. (This solution may be made by sterilizing at 100° C. in the Arnold for one and one-half hours and kept as a stock solution. Bacteria will not grow in this strength sugar solution. If mold growths appear, they are readily detected and the solution should be discarded.)

(*b*) One cubic centimeter of stock basic fuchsin solution. (Made up by dissolving 10 grams of basic fuchsin in 100 cubic centimeters of 95 per cent ethyl alcohol. Let stand 24 hours and filter.)

(*c*) Dissolve 0.125 grams of anhydrous sodium sulphite in hot distilled water and add. (This solution must be made up fresh each time immediately before using.)

(3) Mix thoroughly at once and pour plates.

(4) Allow plates to harden and dry in the incubator before streaking.

Form No. 1
COLLABORATING CHEMIST

Summary of daily laboratory results at ---------- filtration plant

Month and year ------------------

Day	Temp.	Turbidity			Alk'y		Bact./c. c.—48 hrs. at 20° C.					Bact./c. c.—24 hrs. at 37° C.					B. coli results																
																	Raw					Settled				Coag.				Fil.		Fin.	
																														10		10	
		Raw	Sett.	Coag.	Raw	Coag.	Raw	Sett.	Coag.	Filt.	Fin.	Raw	Sett.	Coag.	Filt.	Fin.	0.0001	0.001	0.01	0.1	1.0	0.001	0.01	0.1	1.0	0.01	0.1	1.0	10.0	−	+	−	+
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Average																																	
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Minimum																																	

Summary of daily operation at ---------- filtration plant

Month and year------------------ COLLABORATING CHEMIST Form No. 2

Day	Total water treated (thousand gallons)	Filters			Washing				Chemicals used (pounds)						Chemical dosage						River stage (ft.)	Remarks
															Gr. per gal.			P. p. m.				
		Number used	Filt. (hrs.)	Av'g. run (hrs.)	Total number	Time, (min.)	Rate, I/M	Air (min.)	Alum	Iron	Soda ash	Lime	Hypo.	Liq. cl.	Alum	Iron	Soda ash	Lime	Hypo.	Liq. cl.		
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(Circular Memorandum No. 3)

Inclosed herewith is a form entitled "Record of Laboratory Technique," which is designed for the purpose of securing from each collaborating chemist a detailed and systematic statement of the technique employed at this plant for the collection and examination of water samples. It is desired that this form be filled out promptly and returned to this office. Its preparation should not require an undue amount of labor or time, since the information requested is of such a nature that it will readily come to mind.

It is requested that particular attention be devoted to filling out a complete and accurate record of sample collections. In this connection a statement is desired as to the number of individual samples the record for which enters into the daily average figure reported in each case on the monthly summary form. This statement may be appended to the record or entered on it at a suitable place.

Wherever the procedure employed deviates from that which is provided for in the form the particular variation employed should be stated.

RECORD OF LABORATORY PROCEDURE

........................Filtration Plant. Date..................192..

Record supplied by..

....

Sample collections:

Sample	Number of collections		Hours of collection
	Daily	Weekly	
Raw			
Plain settled			
Coagulated—primary			
Coagulated—secondary			
Applied			
Filtered			
Disinfected			

Remarks ....

Place and method of collection:

Sample	Where collected	Collected by—	Container (capacity)	Kind of sample		
				Physical	Bacterial	Chemical
Raw						
Plain settled						
Coagulated						
Applied						
Filtered						
Disinfected						

Special samples collected:

Kinds..........................

Frequency..........................

Remarks..

Determinations made:

Determination	Raw	Plain settled	Coagulated	Applied	Filtered	Disinfected
Temperature						
Turbidity						
Color						
Odor						
Plate count—20° C						
Plate count—37° C						
B. coli—presumptive						
B. coli—confirmed						
Alkalinity—Bi-carb						
Alkalinity—Mono-carb						
Hardness						
pH						
Fe, Al, Ca, Mg						
Other mineral						
Organic:						
Tot. nit						
Free NH_3						
Alb. NH_3						
NO_2						
NO_3						
$KMnO_4$ Cons'd						
Other						
Special tests						

Remarks ....

Turbidity:
1. Standard suspension—
   - *a.* Material ....
   - *b.* Method of preparation ....
   - *c.* Frequency of renewal ....
2. Method of determination—
   - *a.* Turbidimeter, turbidities .... to ....
   - *b.* Bottle standards, turbidities .... to ....
   - *c.* Tube standards, turbidities .... to ....
   - *d.* Turbidity rod, turbidities .... to ....
3. Turbidimetric determination—
   - *a.* Standard candle used? ....
   - *b.* Electric bulb used? .... bulb; .... watts.
   - *c.* Calibration, standard ....
4. Bottle standard determination—
   - *a.* Size of bottle ....; shape ....
   - *b.* Background ....
   - *c.* Transmitted light? ....; reflected light? ....
5. Tube standard determination—
   - *a.* Size of tubes ....
   - *b.* Uniformity of length ....
   - *c.* Readings through tube: Vertically? ....; horizontally? ....
6. Turbidity rod—
   - *a.* Kind used ....; U. S. G. S. standard? ....
   - *b.* Points where readings taken ....
   - *c.* Light conditions ....

Alkalinity:
1. Indicator used ....
2. Volume titrated ....
3. Standard solution used ....
4. End point ....

Hydrogen ion determinations:
1. Points where determinations made ....
2. Frequency of tests ....
3. Standard used ....
4. Methods—
   - Comparator block ....; lithograph colors ....
   - Clark-Lubs standards ....

Residual chlorine:
1. Points of observation ....
2. Frequency ....
3. Methods ....; starch iodide ....; O—tolidin (*a*) temporary standards. (*b*) Permanent standards. Use acetic or hydrochloric acid in preparing O—tolidin solution ....

Remarks ....

Other chemical tests:
1. Mineral constituents (total hardness, Ca. Mgn., etc.) ....
2. Sanitary constituents (nitrogen, permanganate consumed) ....

Bacteriological examinations

1. Culture media (note where dehydrated media used):

a. Broth—beef infusion? ----------; beef extract? ----------; brand ----------; amount (%) ----------; is muscle sugar removed from infusion? ----------

1. Peptone—Brand ----------; amount (%) ----------
2. Water—Distilled? ----------; tap? ----------; other source? ----------
3. Titration—When? ----------; final reaction ----------; method of adjustment of reaction ----------
4. Sugar—Amount (%) ----------; kind ----------; how added ? ----------
5. Sterilization—Sugar added before? ----------; after? ----------
   Method—Auto clave ---------- pounds pressure for ---------- minutes; time under heat ---------- minutes. Arnold ---------- times, ---------- at ---------- pounds pressure, for ---------- minutes each time.
   Method of cooling ----------
   Method of clearing inverted tube of air ----------
6. Tubing technique ----------

b. Gelatin—

1. Brand ----------; amount (%) ----------
2. Meat infusion? ----------; extract? ----------; amount (%) ----------
3. Peptone—Brand ----------; amount ----------
4. Titration (see above).
5. Sterilization—Pressure ---------- pounds for ---------- minutes ---------- Cooling—Room? ----------; ice box? ----------; cold water? ----------; other method? ----------
6. Containers—Tubes? ----------; flasks? ----------; amounts ----------
7. Clarification—Egg used? ----------; not used? ----------

c. Plain agar—

1. Brand ----------; amount (%) ----------
2. Meat infusion? ----------; extract? ----------; amount (%) ----------
3. Peptone—Brand ----------; amount ----------
4. Titration (see above).
5. Sterilization—Pressure ---------- pounds for ---------- minutes ---------- Cooling—Room? ---------- ice box ---------- cold water? ----------; other method? ----------
6. Containers—Tubes? ----------; flasks? ----------; amounts ----------
7. Clarification—Filtered clear ----------

d. Endo agar—

1. Brand ----------; amount (%) ----------
2. Meat infusion? ----------; extract? ----------; amount (%) ----------
3. Peptone—Brand ----------; amount ----------
4. Titration ----------
5. Sterilization—Pressure ---------- pounds for ---------- minutes ---------- Cooling—Room? ----------; ice box? ----------; cold water? ----------; other method? ----------
6. Containers—Tubes? ----------; flasks? ----------; amounts ----------
7. Sulphite—Quantity added? ----------; how prepared? ----------
   Fuchsin—Quantity added? ----------; how prepared? ----------

e. Eosin methylene blue agar—

1. Brand ----------; amount (%) ----------
2. Meat infusion? ----------; extract? ----------; amount (%) ----------
3. Peptone—Brand ----------; amount ----------
4. Sterilization—Pressure ---------- pounds for ---------- minutes ---------- Cooling—Room? ----------; ice box ----------; cold water? ----------; other method? ----------
5. Containers—Tubes? ----------; flasks? ----------; amounts ----------
6. Eosin—Kind ----------; quantity added ----------; methylene blue—Kind ----------; quantity added ----------; lactose—Kind ----------; quantity added ----------; reagents added before ---------- or after ---------- sterilization.

f. Dextrose-peptone-phosphate broth—

Amounts (%) of—dextrose ---------- %; peptone ---------- %; phosphate ----------%
Kind—Dextrose ----------%; peptone ----------%; phosphate----------%

2. Sterilization of glassware:

a. Plates and tubes—
Temperature ----------° C.; time ----------
Cleaning—Methods ----------
Use of cleaning fluid ----------

b. Pipettes—
Temperature ----------° C.; time ----------
Cleaning methods ----------
Cleaning fluid—Kind ----------; time of exposure ---------- frequency ----------
Plugged with cotton? ----------

3. 20-degree counts:

a. Incubation period ---------- hours; temperature ----------°C. varying from ---------- to ----------
b. Culture medium—Gelatin? ----------; agar? ----------
c. Remarks ----------

4. 37-degree counts:

a. Incubation period—24 hours? ....; 48 hours? ....; actual period .... hours. Temperature of incubation ....° C., varying from ....° C. to ....° C.

b. Culture medium—Standard agar? ....; other? ....

c. Remarks..

5. Plating and counting technique:

a. Dilutions—

1. Kind of dilution water—Distilled? ....; tap? ....; other ....

2. Amounts of dilution water prepared—9 c. c.? ....; 99 c. c.? ....; other ....

Use of fractional pipettes? ....

3. Constancy of volume of dilution water after sterilization ....; how often checked? ....

4. Sterilization of dilution water—

Auto clave .... pounds for .... minutes.

Arnold .... times for .... minutes each time.

5. Time dilution water kept before use—Average ....; max. ....

b. Plating—

1. Time of contact between portion of sample and dilution water—In dilution bottle .... minutes; on plate .... minutes.

2. Number of plates made per sample ....

Number of duplicate plates made per sample ....

3. Method of mixing portion of sample with dilution water .... Shaking? ....; number of shakes? ....; other procedure ....

4. Limiting number of colonies per plate .... to ....

5. Blank (or control) plates (frequency). On media and glassware? ....; on dilution water? ....

6. Counting technique—

Counting plate used? ....; kind ....

Counting lens used? ....; kind ....

Illumination—Natural light? ....; artificial? ....

Tallying counter used? ....

Colonies counted or excluded—

Pin-point colonies? ....

Colonies within spreaders? ....

Liquefied colonies? ....

7. Remarks..

6. *B. coli* determination:

a. Culture media—Lactose broth? ....; lactose bile? ....; dextrose broth? ....

b. Volume of media tubed—For 1 c. c. portions and less ....; for 10 c. c. portions ....

c. Tubes, type, inverted vial? ....; Smith? ....

d. Method of inoculation of tubes—

End of pipette flamed? ....

Portion discharged directly into broth? ....

Portion discharged along inside wall of tube? ....

e. Dilutions—

1 Number of different dilutions made ....

2. Dilution intervals ....

3. Are a sufficient number of dilutions habitually made to give negative test in highest dilution? ....; if not, state procedure ....

f. Incubation—

Ordinary temperature ....° C.; varying from ....° C. to ....° C.

Ordinary time to first recording of gas .... hours.

Ordinary time to second recording of gas .... hours.

g. Steps in procedure—

1. Primary inoculation into lactose broth? ....; lactose bile? ....

2. Primary incubation .... hours at ....° C. to time of .... first gas observation.

a. Gas formation ....% or more constitutes a positive test—

1. Is this test considered as sufficient for all other than smallest portion showing gas at this time? ....; for all portions, including smallest where raw water tested? ....

2. Is gas formation of less than 10% in 24 hours considered inconclusive? ....; bubble recorded ....; significance attached to bubble? ....

3. Secondary incubation—

After first gas observation, incubation continued .... hours to second gas observation, making total of .... hours.

Second gas observation—

Does any amount of gas observed constitute a doubtful test, to be carried further? ....

Confirmed test? ....

Does no gas observed in total of 48 hours consitute a final negative test? ....

4. Plate from primary broth tube—

a. Endo? ....; eosin methylene blue? ....; lactose litmus agar? ....

b. Plate made on smallest gas-forming portion? ....; on other portions ....

c. Period of primary incubation of plate .... hours to .... hours.

d. Colonies—

1. What is considered a typical positive colony? ....

2. How many colonies selected for identification? ....

e. Secondary incubation? ....; for .... hours to .... hours:

Are colonies selected for confirmation after secondary incubation if typical? ....

If not typical ....

6. *B. coli* determination—Continued.
    5. Confirmatory tests—
        c. Plate colonies fished to—
            1. Secondary lactose tube? ....; incubated .... hours at .... ° C.
            2. Agar slant? ....; incubated .... hours at .... ° C.
                a. If gas formed in secondary tube, is test carried further? ....; is test considered confirmed, positive? ....
                b. If no gas formed, is test considered completed and negative? ....
    6. Further tests (note briefly) ....

(Circular Memorandum No. 4)

CALCULATION OF THE B. COLI INDEX FROM FERMENTATION TUBE TESTS

In compiling the laboratory results being received on monthly summary forms from the group of collaborators in the present study of filter plant performance, considerable variation has been noted in the methods employed by different collaborators in computing the monthly *B. coli* index from the results of fermentation tube tests. In several cases it has been found impossible to check the reported index by any known method in common use, necessitating a recalculation of the index in accordance with the Phelps method, which is employed as standard procedure in this office. In other cases, the method used by the collaborator appears to correspond with the Phelps procedure, but the result obtained indicates slight divergences from uniform practice in matters of detail.

Since it obviously is essential, in connection with the present study, that a uniform method of computing the *B. coli* index be applied to the results from the various plants in order that the figures may be strictly comparable, it is proposed to outline in detail the method of calculation which is being used in this office to reduce all index values to a standard basis. It is requested that in the future each collaborator use the same procedure as herein outlined in computing his *B. coli* index figures for inclusion with his monthly summaries intended for transmission to this office. It is his privilege, of course, to compute the index in any way he pleases for purposes of his own record.

For a particular sample of water, the Phelps *B. coli* index is given by the reciprocal of the smallest fractional portion of a unit volume (e. g., a cubic centimeter) in which a positive test for this organism is obtained. If, for example, this smallest portion be 0.001 cubic centimeter, the *B. coli* index for the sample is 1,000 per cubic centimeter. For a series of samples, or individual tests, the average index is given most accurately by the arithmetical mean of the individual indices of the series. For example, the mean index for the following series of tests is accurately obtained by the method indicated:

Test No.—	B. coli positive in—				B. coli index per cubic centimeter
	0.001 c. c.	0.01 c. c.	0.1 c. c.	1 c. c.	
1	0	0	+	+	10
2	+	+	+	+	1,000
3	0	+	+	+	100
4	0	0	+	+	10
5	0	0	0	+	1
6	0	+	+	+	100
7	0	0	0	+	1
8	+	+	+	+	1,000
9	+	+	+	+	1,000
10	0	+	+	+	100
11	0	0	0	+	1
12	0	0	+	+	10
13	+	+	+	+	1,000
Total number	4	7	10	13	4,333

Mean .... (per c. c.) .. 333
Or .... (per 100 c. c.) .. 33,300
(To three significant figures only.)

The summation may be made more conveniently by direct inspection of the recorded results of the fermentation tests, merely recording at the bottom of each dilution column the total number of positive results obtained in that dilution, as above indicated. Using this method, the actual pencil work is much abbreviated, as follows:

0. 001 c. c.:		4÷0. 001=	4, 000
0. 01 c. c.	7− 4=3	3÷0. 01 =	300
0. 1 c. c.	10− 7=3	3÷0. 1 =	30
1 c. c.	13−10=3	3÷1 =	3

Sum------------------------- 4, 333
Mean-------------(per c. c.)-- 333
Or-----------(per 100 c. c.)-- 33, 300

The foregoing method of summation and averaging is applicable only where the number of tests made in each dilution is the same and where it is possible to tabulate or enumerate each individual index from each single test. In all other cases it is necessary to resort to the so-called percentage-positive method, which is exactly the same in principle except that percentages, rather than numbers, of positive results are employed for the computation. In using the percentage-positive method it is necessary, moreover, to take certain precautions in the use of significant figures in order to obtain accurate results, as will be shown in the following example.

Employing the same data as in the foregoing example:

In 0. 001 c. c., % positive=(4÷13)×100=30. 769%
30. 769÷0. 001= 30, 769
In 0. 01 c. c., % positive =(7÷13)×100=53. 85%
53. 85%−30. 77%=23. 08%
23. 08÷0. 01= 2, 308
In 0. 1 c. c., % positive=(10÷13)×100=76. 9%
76. 9%−53. 8%=23. 1%
23. 1÷0. 1= 231
In 1 c. c., % positive=100%
100%−77%=23%
23÷1= 23

Sum------------------------------ 33, 331
(Or 33,300 per 100 c. c. to three significant figures.)

In computing the percentage-positive figures it is advisable to carry each one of them to a decimal place corresponding with the dilution to which it applies; for example, the percentage positive in 0.001 cubic centimeter should be carried out to thousandths, or three decimal places. In making the subtractions of percentage figures in passing from one dilution to the other the extra decimal figure in the percentage as applied to the higher dilution may be dropped, as shown in the example. If this procedure is followed, the end result should be accurate to the next to the last figure (in the example shown it is accurate to the "tens" decimal place).

The rule regarding the number of significant figures to be retained in the final *B. coli* index is a simple one; namely, retain three significant figures wherever the index is equal to or greater than 10 per 100 cubic centimeters and retain but two significant figures where the index is less than 10 per cubic centimeter. All index figures should be calculated in terms of the number per 100 cubic centimeters.

Any questions arising concerning the interpretation of this memorandum will be gladly answered.

(Circular Memorandum No. 6)

FINAL REVISION OF LABORATORY METHODS

Turbidity determinations:
- 1. Standard suspension—
  - (*a*) Material: Precipitated fuller's or diatomaceous earth.
  - (*b*) Method of preparation: Screen through 200-mesh sieve. Make up suspension of screened material in distilled water (approximately 1 per cent concentration by weight). Shake thoroughly and allow to stand quiescent for 24 hours. After thus settled, pipette or siphon off supernatant liquid containing nonsettled material. Adjust turbidity of this supernatant liquid to 100, 500, or 1,000, checking several times with turbidimeter, and use resulting suspension as a basis for standards. Can use $HgCl_2$ (1: 10,000) as preservative.
  - (*c*) Frequency: Standards should be checked not less frequently than once per month, preparing new standard if readings off more than 10 per cent.
- 2. Method of determination—
  - (*a*) Turbidimeter: Turbidities 26 to 500. (Dilute where turbidity over 500).
  - (*b*) Bottle standards: Turbidities 0 to 25.
  - (*c*) Turbidimetric determinations: Standard English candle (1 c. p.) or standardized electric bulb (1 c. p.). End point to be taken as minimum depth at which the light becomes evenly diffused over the cross section of the liquid.
  - (*d*) Bottle standard: By north window light, if practicable, using dark background. Bottles should be not less than 1 liter in capacity.

Alkalinity:
- (*a*) Indicator: Methyl orange.
- (*b*) Volume titrated: 100 cubic centimeters.
- (*c*) Standard solution: N/50 H_2SO_4.
- (*d*) End point: First change to faint orange pink. Subtract blank reading, determined with distilled water titrated to same end point.

pH determinations (optional except for culture media):
- (*a*) Standards: La Motte or Clark's buffered solutions.
- (*b*) Method: Use comparator block.

Residual chlorine (optional):
- (*a*) Reagent: O—tolidin.
- (*b*) Standards: Temporary, O—tolidin.

Bacteriological examination:
- 1. Culture media—
  - (*a*) Broth: 0.3 per cent Liebig's or Difco (muscle sugar not removed)—
    - 1. Peptone: Amount, 0.5 per cent; kind, Difco or Coleman-Bell.
    - 2. Water: Distilled.
    - 3. Reaction: Final pH, 6.5 to 7.
    - 4. Lactose: Amount, 0.5 per cent; kind, Difco or equal.
    - 5. Sterilization:

Plain broth: 15 pounds for 15 minutes after pressure reaches 15 pounds.

Lactose broth: 12 pounds for 15 minutes after pressure reaches 12 pounds.

(Total time under heat, not more than 30 minutes.)

CAUTION.—Before putting the autoclave under steam pressure the exhaust petcock should be left open for five minutes and the steam allowed to escape, in order to remove all air from inside the autoclave.

NOTE.—If exposure of sugar broth to heat can not be limited to 30 minutes or less, make up separately a 10 or 20 per cent solution of lactose in distilled water, sterilize at 12 pounds for 15 minutes, add to sterile nutrient broth in amounts sufficient to make 0.5 per cent sugar, and tube; sterilize tubed medium in streaming steam for 30 minutes after temperature has reached 100° C.

Bacteriological examination—Continued.

1. Culture media—Continued.
   - (*b*) Gelatin (not used at any of the five plants).
   - (*c*) Plain agar—
     1. Agar: Difco or equal. Amount, 1.5 per cent of undried market product, as stored in ordinary laboratory cupboard.
     2. Broth: 0.3 per cent Liebig's or Difco beef extract.
     3. Peptone: 0.5 per cent Difco or Coleman-Bell.
     4. Reaction: Final pH, 6.5 to 7.
     5. Sterilization: 15 pounds for 15 minutes after pressure reaches 15 pounds.

        Cooling, preferably in ice box or cold water.
     6. Containers: Tubes (10 cubic centimeters) or flasks (100 cubic centimeters).
     7. Clarification: Filtered clear, through cotton or cotton flannel, or both.

        NOTE.—The use of Difco dehydrated agar medium is permissible if its final reaction is adjusted to a pH of 6.5 to 7.
   - (*d*) Endo agar (optional)—
     1. Kind: Should be prepared in laboratory. Dehydrated medium not satisfactory.
     2. Broth: Same as for plain agar.
     3. Peptone: Same as for plain agar.
     4. Reaction: pH, 7.8 to 8.2 after addition of chemicals.
     5. Sterilization: Same as for plain agar.
     6. Containers: Same as for plain agar.
     7. Sulphite: 0.125 grams (C. P. anhydrous) per 100 cubic centimeters of medium.
     8. Fuchsin: Basic solution, 10 in 95 per cent alcohol. Add 0.5 cubic centimeter of basic solution to 100 cubic centimeters of medium.
     9. Sugar: 1 per cent of C. P. lactose.
   - (*e*) Eosin methylene blue agar (optional):
     1. Kind: Difco dehydrated permissible.
     2. Peptone: Kind, Difco. Amount, 10 grams per liter.
     3. Di-potassium phosphate: C. P., 2 grams per liter.
     4. Agar: 15 grams per liter (undried material).

        Stock agar.
     5. Chemicals (to be added to 100 cubic centimeters of melted stock agar just prior to using—
        - Lactose (C. P.): 5 cubic centimeters of sterile 20 per cent solution.
        - Eosin (yellowish): 2 cubic centimeters of 2 per cent aqueous solution.
        - Methlene blue: 2 cubic centimeters of 0.5 per cent aqueous solution.

        Mix thoroughly, pour into petri dishes, allow to harden, and inoculate by streaking on the surface.
2. Sterilization of glassware—
   - (*a*) Temperature: Not less than 180° C.
   - (*b*) Time: Not less than 2.5 hours.
   - (*c*) Cleaning: Where chromic or other acid is used as a cleaning fluid, glassware should be rinsed at least three times in fresh water, and more if necessary, to insure its freedom from even small traces of acid. The same rule should be applied in rinsing glassware cleaned with strong soap or washing compound.
3. Twenty-degree count—

   Incubation period, 48 hours. Temperature, 20° C.
   Culture medium, standard nutrient agar.
4. Thirty-seven-degree count—

   Incubation period, 24 hours. Temperature, 37°–37.5° C.
   Culture medium, standard nutrient agar.

Bacteriological examination—Continued.

5. Plating and counting technique—

(*a*) Dilutions—

1. Kind of dilution water: Unchlorinated filter effluent.
2. Amounts of dilution water prepared: 99 cubic centimeters. Fractional pipettes: Should be used for $\frac{1}{10}$ and $\frac{1}{1000}$ cubic centimeters, if practicable. Avoid the use of 9 cubic centimeters dilution except where it is measured accurately into a sterile tube just before using.
3. Sterilization: 15 pounds for 15 minutes after reaching 15 pounds.
4. Period between preparing and using dilution water: Not exceeding 10 days.

(*b*) Plating—

1. Time of contact between portion of sample and dilution water: In dilution bottle, not more than two minutes; on plate, not more than three minutes.
2. Number of plates made per sample: Raw water, two plates in one dilution and one additional plate in higher or lower dilution. Effluents, two plates in one dilution (or undiluted).
3. Plating technique: Mixing of sample, 25 vigorous shakes in original bottle and in each dilution bottle. Temperature of culture medium, not less than 40° C. or higher than 43° C. at time of pouring plate. Flaming, delivery end of pipette and lips of all test-tubes and flasks to be flamed, but not so intensely as to cause overheating of sample or culture medium at point of delivery.
4. Limiting number of colonies per plate: Not less than 30 or more than 300, so far as practicable. Where colonies are outside these limits, plate should be counted but marked as "estimated" (abbreviation, "est.").
5. Blank (or control plate): Should be made for every new batch of culture media or dilution water; also one blank plate should be made every second or third plating as a check on technique and glassware.
6. Counting technique—
    - Counting plate: Should be used.
    - Counting lens: Should be used (important). Suitable type a lens of 2½ diameter magnification, 3½ X, with focal distance of 3½ inches.
    - Illumination: Should be artificial light, using a standard 25-watt Mazda bulb, and suitably arranged counting chamber. (Very important to unify practice in this respect if comparable counting results are to be obtained.)
    - Tallying counter: Optional but preferable in the interests of accuracy. All of colonies on plate should be counted; sectional method subject to considerable error.
    - Colonies excluded or included: Pin-point colonies, included with count but presence noted.
    - Colonies within spreaders: Counted unless obviously a secondary growth from the spreaders.
    - Liquefied colonies: Counted where practicable.
7. Expression of results: For count on individual plate, record actual figures; for average count on individual sample and for average of two or more counts on individual samples, record result to first three significant figures only.

Bacteriological examination—Continued.

6. *B. coli* determination—
    - (*a*) Definitions—
        1. The *B. coli* group to be considered as including all nonspore-forming bacilli which ferment lactose with gas formation and grow aerobically on standard solid media.
        2. The formation of 10 per cent or more of gas in a standard lactose broth fermentation tube within 24 hours at 37° C. to be considered as presumptive evidence of the presence of members of the *B. coli* group.
        3. The appearance of aerobic lactose-splitting colonies on Endo or eosin-methylene-blue agar plates made from a lactose broth fermentation tube in which gas has formed, to be considered as partially confirmatory evidence of the presence of members of the *B. coli* group.
        4. The formation of gas in a secondary lactose broth tube inoculated with one or more of these aerobic plate colonies consisting of nonspore-forming bacilli, to be considered as a completed confirmatory demonstration of the presence of members of the *B. coli* group.
        5. The standard tests for the *B. coli* group to be: (*a*) The presumptive, as in (2) above; (*b*) the partially confirmed, as in (3) above, and (*c*) the completed or confirmed, as in (4) above.
    - (*b*) Culture medium—
        1. Kind: Standard 0.5 per cent lactose broth (pH 6.8–7.2).
        2. Volume tubed—
            - 5 cubic centimeters for 1 cubic centimeter amounts of sample.
            - 20 cubic centimeters for 10 cubic centimeters amounts of sample.
    - (*c*) Tubes: Durham, or inverted vial, tube.
    - (*d*) Inoculation—
        1. Flame tube lightly.
        2. Discharge portion directly into broth.
    - (*e*) Dilutions—
        1. Number: 3, 4, or 5, or number sufficient to give negative gas test in highest dilution.
        2. Intervals: Tenths (e. g., 0.01, 0.1, and 1.); five 10 cubic centimeters portions for effluents.
        3. Time from preparation of dilution to inoculating tube: Not over five minutes.
    - (*f*) Incubation—
        1. Temperature: 37°–37.5° C.
        2. Time to first gas reading: 24 hours.
        3. Time to second gas reading: 48 hours.
    - (*g*) Presumptive test—
        1. Primary inoculation into lactose broth ("A" tube).
        2. Primary incubation (up to 24th hour)—
            - *a.* 10 per cent or more of gas: Positive presumptive test.
            - *b.* Less than 10 per cent: Doubtful test, to be carried further.

        NOTE.—Endo or E. M. B. plates to be made at end of or during primary incubation period (24 hours), from highest dilutions giving gas within that period.

        3. Secondary incubation (24th to 48th hour)—
            - *a.* Continued to 48 hours from start.
            - *b.* Any gas at 48 hours in tubes giving no gas at 24 hours: Doubtful test, to be continued by plating on Endo or E. M. B.
            - *c.* Absence of gas at 48 hours: Negative test.

Bacteriological examination—Continued.

6. *B. coli* determination—Continued.

(*h*) Partially confirmed test—

1. Make one or more Endo or E. M. B. plates from the tube which, after 48 hours incubation, shows gas formation from the smallest amount of water tested. (If a plate was made prior to or at the end of 24 hours' incubation, the 48-hour plate may be omitted, unless a higher dilution has developed gas between the 24th and 48th hour, in which case both plates are carried.)
2. Incubate the plates at 37° C. for 18 to 24 hours.
3. If typical colon-like colonies have developed upon the plate within this period, the partially confirmed test may be considered as positive.
4. If no typical colonies have developed within 24 hours, complete the test as under the following section (*i*).

(*i*) Completed test—

1. From typical plates: Fish at least two typical colonies, transferring each to an agar slant and a secondary B lactose fermentation tube.
2. From atypical plate: If no typical colonies have appeared within 24 hours, reincubate for another 24 hours, after which at least two of the colonies considered most likely to be *B. coli*, whether typical or not, shall be transferred to B lactose fermentation tubes.
3. Interpretation of (1) and (2): Incubate the B tubes thus inoculated until gas formation is noted; the incubation period not to exceed 48 hours. The formation of gas in lactose broth shall be considered a satisfactory completed test, demonstrating the presence of a member of the *B. coli* group. The absence of gas formation in the B lactose broth tube constitutes a negative test.

(*j*) Résumé of presumptive, partially confirmed, and completed tests as given in (*g*), (*h*), and (*i*).

1. Presumptive test—

    a. When definitely positive (that is, giving more than 10 per cent of gas in 24 hours) is sufficient—

    (1) As applied to all except the smallest gas-forming portion of each sample in all examinations.

    (2) As applied to the smallest gas-forming portion in the examination of raw, settled, or applied water.

    b. When definitely negative (that is, giving no gas in 48 hours) is final and sufficient in all cases.

    c. When doubtful; that is, giving gas less than 10 per cent (or more) in 24 hours, with gas either more or less than 10 per cent in 48 hours, must always be confirmed.

2. Partially confirmed test—

    a. When definitely positive (that is, when giving typical plate colonies within 24 hours), is sufficient—

    (1) When applied to confirm a doubtful presumptive test in cases where the latter, if definitely positive, would have been sufficient.

    (2) In routine examinations where a sufficient number of prior examinations have established the accuracy and significance of this test in terms of the completed test.

    b. When doubtful (that is, when giving colonies of doubtful or negative appearance in 24 hours) must always be completed.

Bacteriological examination—Continued.

6. *B. coli* determination—Continued.

(*j*) Résumé of presumptive, partially confirmed, and completed tests as given in (*g*), (*h*), and (*i*).

3. Completed test.

The completed test is required as applied to the smallest gas-forming portion of each sample in all cases other than those noted as exceptions under the presumptive and partially confirmed tests. The completed test is required in all cases where the result of the partially confirmed test has been doubtful.

(*k*) Recording of *B. coli* results.

1. The following notation should be employed in recording results, both on the original records and on the summary sheets:
    - *a*. Negative result..........................(−)
    - *b*. Doubtful result..........................(?)
    - *c*. Positive presumptive result.................(+)
    - *d*. Positive partially confirmed result...........(±)
    - *e*. Positive completely confirmed result.........(#)
2. In general, the presumptive test will be employed for samples of raw and plain settled water, the partially confirmed test for samples of coagulated and applied water, and the completed test for samples of filtered and finally disinfected water.
3. Computation of the *B. coli* index: The directions in Circular Memorandum No. 4 to be rigidly followed, counting as a positive result all results designated as (+), (±), or (#).

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